DISCOVERY

A MONTHLY POPULAR JOURNAL OF KNOWLEDGE

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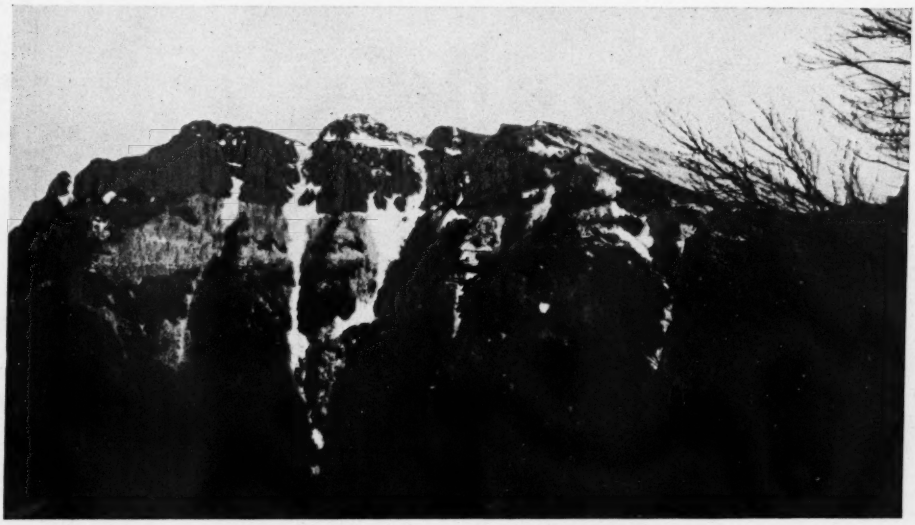

A MOUNTAIN ONCE SACRED TO DIONYSUS
(Mount Pangæum in North-eastern Greece)

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JOHN MURRAY, 50A ALBEMARLE STREET, LONDON, W.1.

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Editorial Notes

WE have long passed those days when a famous missionary wrote the lines:

> "Though every prospect pleases
> And only man is vile."

True, one meets people from time to time who call all races, whose skin pigmentation is darker than that of the European, by the name of "niggers," and who cannot understand any point of view concerning them except that of regarding them as so much potential labour to benefit the white man. But such persons are fading away into a minority, and white civilisation as a whole has for a long period endeavoured to apply to the particular subject races under its control an attitude not merely of tolerance, but of understanding and sympathy both in thought and action.

In two notable instances, indeed, within the British Empire, special attempts have been made to preserve the original native races. A careful segregation of the Red Indians has been adopted in Canada, while in Australia the aborigine has been allotted a sanctuary consisting of 65,700 square miles on the borders of South Australia, Western Australia, and the Northern Territory.

* * * * *

We have, however, to face a most unpleasant fact, and that is the decadence which sets in amongst the majority of primitive or semi-primitive races after the white man has come into their midst. Moreover, amongst tropical peoples the arrival of white civilisation results not only in moral and physical decadence, but in depopulation on an extensive scale. Recently two important books have appeared on this subject, and we feel that it will not be out of place here to summarise the information and conclusions which they offer. The first book is a collection of papers by doctors, missionaries, and Government officials on depopulation amongst the Melanesian inhabitants of the Western Pacific archipelagoes, edited by a famous Cambridge psychologist, who made personal investigations on the spot.[1] The second is the account, by a well-known Alsatian theologian and doctor, of his four and a half years' experiences as a medical missionary amongst the natives of the Ogowe district, which lies between the mountains of Central Africa and the Gulf of Guinea.[2]

* * * * *

It must be admitted that the evidence in the first book is rather conflicting, though the evils which European contact with the natives of Melanesia has produced are undeniable and may be roughly summarised as follows: depopulation and physical decadence have chiefly resulted from (*a*) the introduction of Western diseases, particularly of venereal diseases; (*b*) the sale of alcohol and opium; (*c*) the wearing of clothes; (*d*) the recruiting of labour which takes men and women away from their islands to other islands. With regard to the last two causes. In many islands, before the arrival of the white man, no clothes at all were worn; in others, the men wore loin-cloths and the women small skirts. Such clothing was amply sufficient, and it is amply sufficient now. Both traders and missionaries have been responsible for the introduction and encouragement of clothes, though too much blame has, perhaps, been attached to the

[1] *Essays on the Depopulation of Melanesia.* Edited by W. H. R. Rivers, M.D., F.R.S. (Cambridge University Press, 6*s*.)

[2] *On the Edge of the Primeval Forest.* By Prof. Albert Schweitzer. Translated by Ch. Th. Campion. (A. and C. Black, Ltd., 6*s*.)

latter. "The Melanesians," as Mr. Durrad, who has served for many years in the Melanesian Mission on Torres and Banks Islands, points out, "are ignorant of the real objects of clothing, and seem to look on it more as a way of ornamenting the person than as anything else. . . . European clothes are unnecessary and are a source of disease. Moreover, they are worn without any system of consistency. A man will wear, perhaps, a flimsy loin-cloth and a hat. Another day, a warmer one, he may appear in a shirt in addition. On yet another occasion one sees him in a pair of trousers only; or, again, in trousers and waistcoat. Or, if a full-blooded indentured workman, he appears garbed in trousers, shirt, possibly also a vest, a dungaree jacket, and a hat. . . . The women wear several layers of skirts and often a sort of short bodice. As a skirt becomes ragged another is superimposed, while the rags beneath gradually rot off. Clothes are worn till they cease to exist as recognisable garments." Such descriptions make amusing enough reading, but the effects of these practices are disastrous on islands where dampness prevails for long periods of the year. The recruiting of labour by planters, which is nowadays carried out voluntarily (except that "Frenchmen at times use violence and craft to get recruits"), takes men and women away from their tribes at the time of life when they should be producing children, and for this reason alone is one of the largest causes of depopulation. Moreover, numbers of them never return. This is especially the case with the Torres Islanders, who are enticed to go to plantations in the Southern New Hebrides. "Kept in debt by their French masters or tempted by alcohol, they are tied and bound for term after term of service and can rarely get free from the bonds which hold them." Perhaps more important than all is the psychological effect of this prolonged absence from their homes, which sends them back only to be discontented with their old surroundings after tasting the pleasures of civilisation, and eventually to become a discordant and revolutionary element in the communal life.

* * * * *

Here we come to what the late Dr. Rivers considered the most potent agent in the downfall of these races—the psychological changes which we have not been able to prevent ourselves from forcing upon them, or have forced upon them unwittingly, in the past. "When Melanesia became subject to Europeans, magistrates and missionaries were sent to rule and direct the lives of the people. They found in existence a number of institutions and customs which were, or seemed to them to be, contrary to the principles of morality. Such customs were usually forbidden without any inquiry into their real nature, without knowledge of the part they took in native life, and without any attempt to discriminate between their good and bad elements." The sudden stopping of head-hunting in the Solomon Islands left so great a gap in the daily interests of the natives that they very speedily lost their virility. The discouragement by missionaries in Fiji of the custom (which seemed to them incompatible with the ideals of the Christian family) by which men and women slept in different quarters, led to too free intercourse between the sexes. Again, in the New Hebrides a "highly complicated organisation arising out of beliefs connected with the cult of dead ancestors" was put an end to with disastrous results, in that it formed a highly important part of the social and economic life of the people. These and many other factors have brought about a loss of interest in life amongst the islanders which, as the late Dr. Rivers has indicated, has sapped their vitality and been both a direct and indirect influence in the process of depopulation.

* * * * *

Professor Schweitzer has come to such similar conclusions on the problem of the relationships betweeen the white and black races in Equatorial Africa that there is no need to enumerate them. Neither book is essentially pessimistic. The outlook is bad, but not hopeless. Where Christianity has, for instance, been carefully fostered in Melanesia so that it has not at once destroyed the old religious traditions and ceremonial, the people have embraced it with enthusiasm and have regained, and even increased, their vitality. In Africa, too, similar results have been obtained.

Yet we have to face the facts and to realise that the first shock of a far-advanced civilisation on primitive and semi-primitive races is so great and destructive, unless carefully regulated, that it may result in complete annihilation, let alone demoralisation. The history of the world may be broadly viewed as a series of these shocks, of these tides of superior civilisations sweeping over and obliterating inferior ones. But we hope that the time has at last come when a superior civilisation will find means of curbing its destructiveness. Some of the measures recommended by these books are: a careful study by officials, missionaries, traders and residents, of the customs of the natives, a gradual bringing into harmony of native customs with European customs and Christianity, financial encouragement of birth-production, more systematic medical research and service, an encouragement of interest in the economic life of the community, the realisation by the white man that natives of tropical countries cannot be overworked with impunity. To sum up in the words of the late Dr. Rivers, "something must be done, and done quickly, to give *the native* that renewed interest in life to which the health of peoples is mainly due."

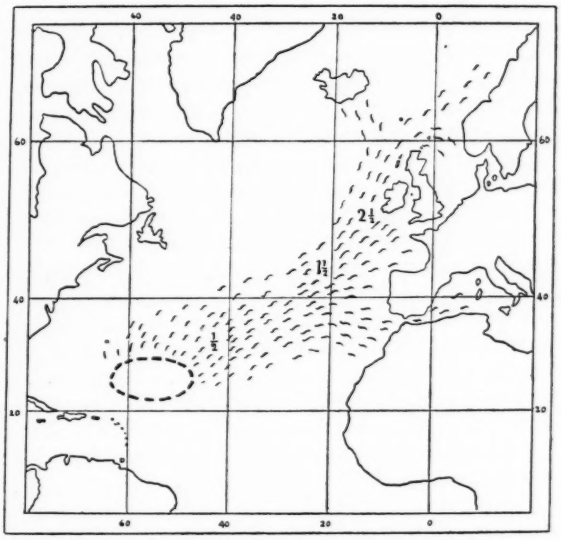
The Migrations of the Eel

By G. P. Farran

In a paper recently published in the *Transactions of the Royal Society of London*, Dr. Johs. Schimdt, the Danish zoologist, has given us almost the last word in the answer to the riddle: "Where do eels come from?" which for some thousands of years has excited the curiosity of mankind. Strange as have been the theories put forward from the time of Aristotle to the present day, the truth as disclosed by Dr. Schmidt is no less strange.

Curious ribbon-like fishes, about 2½ in. long, clear as glass, with pointed head and tail and opaque silvery eyes, to which the name of *Leptocephali* has been given, have long been known in the Straits of Messina, where they were brought to the surface in considerable numbers by ascending currents and whirlpools. These fishes came in time to be regarded as the larvæ of eel-like fishes (abnormal forms according to one school of thought), but it was not until 1893 that the Italians Grassi and Calandruccio, as recorded by the former in a paper, also read before the Royal Society, definitely recognised, by rearing it through its later stages, that the form known as *Leptocephalus brevirostris* was in reality the larva of the common eel. It was at this stage in our knowledge of the eel that Dr. Schmidt started his work by the capture, to the west of the Faeroes, in May 1904, of the first specimen of *Leptocephalus brevirostris* known in the Atlantic. A second specimen, as Dr. Schmidt records, was taken three months later off the west coast of Ireland by the Irish fishery cruiser *Helga*.

We may here review briefly what is known of the eel during its sojourn in fresh water. The eel, when feeding and growing, is characterised by its greenish back, yellow belly, broad head, and small eyes. Formerly in this stage it was regarded as a distinct species, and was called the frog-mouthed eel or yellow eel. When the adult or migrating stage approaches, which may be reached by females after a stay in fresh water of from five to twenty years, with a length of, usually, from 2 to 3 ft., and by the much smaller males after five or six years, with a length of not more than 20 in., a change begins to show itself. The powerful jaw muscles, which gave the head its broad appearance, begin to shrink. The head gets more pointed, the eyes increase in size, and the yellow colour changes to silvery, the eel thus becoming what is known to fishermen as the sharp-nosed eel or silver eel. With this change of form and colour the reproductive organs begin to develop, and the eels start on their journey seawards in autumn and winter. From the pools and lakes of all the countries of Europe they make their way downwards by streams to the larger rivers, and thence to the sea, resting by day and travelling by night, the principal runs taking place on dark moonless nights. This is the season when a heavy toll is taken of them by fishermen at the eel weirs with nets or traps set with their mouths pointing up-stream. In the countries bordering on the Baltic, especially in Germany, Denmark, and southern Sweden, the migrating eels, after they have reached the sea and are making their way along the coast towards the entrance of the Baltic, are taken in large numbers in traps set along the shore. Professor Petersen states that there are no less than 22,608 of these traps on the Baltic coast of Denmark.



DIAGRAMMATIC CHART SHOWING THE BREEDING PLACE OF THE EUROPEAN EEL, AND THE AGE IN YEARS OF THE LARVÆ AT DIFFERENT STAGES OF THEIR JOURNEY TO THE EUROPEAN COAST.

From marking experiments the rate of travel of these coasting eels has been estimated at about ten miles a day.

On its arrival at the open sea we lose sight of the migrating eel, which never returns. It is true that a few chance specimens have been taken, one in a trawl net near the mouth of the English Channel, another in the stomach of a cachalot in the Atlantic, and others in the Mediterranean, either taken from the stomachs of sword-fishes or brought to the surface by the whirlpools of Messina; but detailed knowledge of how they travel, whether in mid-water or along the bottom, and what they feed on, if they feed at all, is still lacking. These eels from the ocean show a

further change. The sexual organs, though not fully matured, have greatly developed, and the eyes have increased to an immense size.

After the departure of the full-grown eels, the next thing that the observer on shore sees is the arrival from the sea of the young transparent glassy elvers, or young eels, of about $2\frac{3}{4}$ in. in length. The earliest arrivals reach the rivers of the west coast of Ireland and the north coast of Spain in November and December. They appear in the Loire in January, in the Seine in February, and do not reach the Danish coast till April.

The passage of the elvers up some of our larger rivers has often been described. They pass up in a steady, continuous stream, heads almost touching tails, in a broad band, surmounting rapids and falls and other dangerous obstacles by scrambling up damp rocks or over weirs.

At Epney-on-Severn, an old-established elver fishery, organised by a German fishery association in 1908 for the purpose of stocking the less favourably situated waters of Germany, and subsequently taken over by the Ministry of Agriculture and Fisheries, serves as a distributing centre for supplying elvers to lakes and rivers of the British Isles whose natural supply is deficient. At this fishery the runs of elvers occur at the flood of the spring tides of April and May, the fishing being done chiefly at night by means of a hand net.

Many elvers remain for a considerable time in salt water, lurking under stones on the shore, before starting their journey inland. By about April the elvers become pigmented and opaque, whether they have ascended a river or are still in the sea, and feeding and consequent growth, which had ceased during the last ten months of their larval life, are again resumed.

After the capture of the Leptocephalid larvæ in the Atlantic in 1904, as mentioned above, Dr. Schmidt began a systematic search for others which, he argued, must be present in immense numbers if only he could find the right locality. Working southwards from off the Hebrides in June 1905, along the edge of the deep water of the Atlantic, he found the larvæ in increasing numbers till they reached a maximum off the south-west coast of Ireland, over a depth of about 500 fathoms. These specimens measured from 60 to 88 mm., with an average size of 75 mm., or 3 in., and were similar to, but slightly larger than, those which had been found in the Mediterranean—thin transparent lanceolate creatures, with small heads and mouths, well furnished with fine teeth.

Still seeking for the younger stages, Dr. Schmidt pushed his researches farther out into the Atlantic. Mainly with the aid of collections made by himself in the schooners *Margarethe* and *Dana*, and with over 500 gatherings made for him on board the ships of various Danish shipping companies, he has traced the *Leptocephali* westwards and southwards back across the Atlantic, finding them ever smaller in size, but more numerous and spread over a smaller area. In mid-Atlantic, in June, the *Leptocephali* had an average length of 52 mm., or about 2 in., and still farther to the westward, also in June, a third group was encountered which had an average length of 1 in. The smallest sizes were found to be concentrated in a comparatively small area, stretching from 22° N. to 30° N. and from 48° W. to 65° W. Within this area, and nowhere else in the North Atlantic, larvæ of $\frac{2}{3}$ in. or less were found in considerable numbers. Here at last, about 2,500 miles from the mouth of the English Channel, and 500 miles north-east of the Leeward Islands, was the breeding place of the eel. Here (to quote the summary which Dr. Schmidt gives in his paper) "spawning takes place in early spring, lasting well on to summer. The tiny larvæ, 7 to 15 mm., float in water layers about 200 to 300 m. (110 to 160 fathoms) from the surface in a temperature of about 20° C. The larvæ grow rapidly, and in the first summer average about 25 mm. They now move up into the upper layers, the great majority being found between 25 and 50 m. (14 to 28 fathoms), or at times even at the surface. During the first summer they are to be found west of 50° W. By the second summer they have attained an average length of 50 to 55 mm., and the bulk are now in the central Atlantic. By the third summer they have arrived off the coastal banks of Europe, averaging 75 mm., but retaining the compressed leaf-like form. In autumn and winter they undergo a retrograde change which brings them to the shape of young eels."

From the time they reach the fully developed larval form in June till the pigmented elver stage is reached nearly a year later, the young eels apparently take no food; at any rate none has been found in the stomach or gut, and the energy for the journey from the Atlantic to fresh water is derived from its reduction in size.

But the mystery of the eel was not yet fully cleared up. There is an American eel (*Anguilla rostrata*) which, but for the fortunate chance that it has a smaller number of vertebræ, from 105 to 111, could hardly be distinguished from the European species, which has from 111 to 119. The larval forms can be separated in the same way, since the myomeres or muscle segments, which can be counted in the larvæ, correspond in number to the vertebræ. In the western part of the breeding area of the European eel the earliest larval stages of the American eel were found in considerable numbers, both species being sometimes taken in the same net. The question then

arose: Why do not the American larvæ make their way to Europe and the European to America? To this riddle, too, Dr. Schmidt has furnished an answer. Tracing the larvæ of the American eel westwards and northwards, he found that the larval stage, which lasts for three years in the European species, is passed through in one year, the elver being then ready to enter fresh water. Consequently, if an American larva should join the current setting for the coasts of Europe, he would find himself in mid-Atlantic at the time when the period for river life arrived, and thus would come to an untimely end. On the other hand, should a European larva be carried to the north-west, he would arrive at the coast with two years of pelagic life still before him, and he too would perish.

Dr. Schmidt, not content with these discoveries, is now completing yet another Atlantic cruise in the new Danish exploring steamer *Dana* with the object of clearing up any points which still remain obscure in the life-history of the eel and, if possible, finding and hatching out its egg, thus completing what is probably one of the most remarkable investigations in marine zoology ever undertaken.

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The Sacred Mountain of Pangæum

By Stanley Casson, M.A.

Fellow of New College, Oxford

FOR a variety of reasons it has come about that the north coast of the Ægean Sea is the least explored part of the European shores of the Mediterranean. From prehistoric times until to-day armies have marched and invading hordes have passed from east to west and west to east along the great highway that stretches from Constantinople to the Adriatic, along this North Ægean shore. As each invader or conqueror appeared, the native population was either displaced or else took to the hills and waited until the trouble had passed. The great movements of peoples from Central Europe to the South and East which took place in prehistoric times at the close of the Bronze Age were deflected southwards into Greece and eastwards into Asia Minor when they reached the sea-coast between Olympus and the Dardanelles. Tribe after tribe moved along the northern coast road, and the remnants of the earlier peoples took to the hills and fastnesses of the mountain ranges that fringe the coast.

Later, in historic times, there came first Megabazus the Persian on a punitive expedition for his master Darius in 513 B.C., and then Xerxes in 481 B.C. Again the native peoples took to the hills; but this time the more disciplined forces of Persia subdued all of them except the tribesmen who had fled to the remoter highlands of the upper Strymon, and the Satræ and Bessi, who lived on the summits of Pangæum. Later still, in 168 B.C., Æmilius Paullus, conquering for Rome, found that there were still many tribes to subdue, and did little but cut an avenue of peace through a forest of savagery. Then later came the Turk, and with him alternating revolt and massacre. Armies of Bulgars, Turks, Greeks, and Serbs have never ceased to move eastwards and westwards along this troubled coast, and still to-day more armies come and go, and peace, that has never yet come to this land, seems as far off as ever. Therefore in antiquity the native peoples lived a semi-nomad life among the hills and the Greek colonists lived along the coast. Each could thus escape the attacks of the other more easily, or equally well of any third party who, as invader, would find the natives inaccessible and the Greeks defended by walls and supplied by sea. Similarly to-day the most flourishing villages exist either along the coast or against the mountains, the latter usually at the entrances of ravines that open a way of refuge to the highlands. Seres, Demir-Hissar, Poroi in the Struma valley, and all the villages on the north side of the plain of Drama, are so situated at the very roots of the hills at the entrance of ravines or clefts. So, too, with Xanthi in western Thrace and with the numerous villages that form a ring right round the foot of Pangæum. The inhabitants could thus escape at a moment's notice and return when the danger had passed, to find their villages sometimes in ashes and sometimes untouched.

So recurrent have been the wars, massacres, deportations, and migrations even in recent times in these regions that little scientific exploration has been possible. A succession of travellers has passed across the Macedonian and Thracian coast, but few have halted and scarcely any have left the beaten track—the old coast road—to explore the highlands on the north or the Greek coast towns on the south. Cyriac of Ancona,[1] in the fifteenth century, passed only along

[1] The MSS. of Cyriac are in the Laurentian Library at Florence.

the high-road. Pierre Belon [1] in the sixteenth and Paul Lucas [2] in the seventeenth century did little more. Cousinèry [3] alone of the nineteenth-century travellers explored extensively and thoroughly: this he could do by virtue of his long residence and his position as Consul of France at Salonika. But he says little or nothing of Pangæum. Leake,[4] whose researches in northern Greece, as in southern Greece, are marked by the ablest scholarship and accuracy and by the most acute judgment, has left a most complete account of western and part of eastern Macedonia; but his travels, which were to have been continued eastwards, were brought to an abrupt conclusion by the outbreak of war between England and Turkey in 1807, and he never

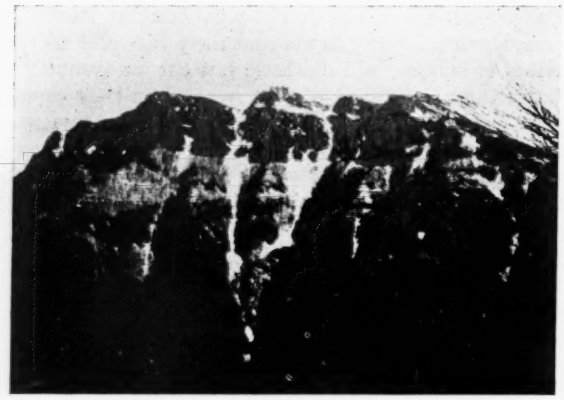

FIG. 1.—THE SUMMIT OF MOUNT PANGÆUM AS SEEN FROM THE SOUTH-EAST.

reached farther east than the Struma valley. Later in the same century the mission sent by the French Government under Heuzey and Daumet [5] carried out some detailed surveys and archæological exploration as far as the plain of Drama, but the east was still untouched and no attempt was made to investigate Pangæum and its problems. Later still two Greeks explored the Pangæan district—Chrysochoos [6] and Mertzides,[7] the former a cartographer, the latter a doctor who lived in Thasos. But Chrysochoos, whose work is able and important, produced no map of the Pangæan area, and Mertzides, who is the only writer to leave an account of an ascent of Pangæum, is brief and unilluminating. Perdrizet,[8] a French scholar, is the only writer of the present century who has made a serious study of Pangæum and the Pangæan area. His work has done much to raise the many historical and archæological problems involved.

Thus it has come about that Mount Pangæum, although distant only a seven-days' journey from London, remains one of the least-known parts of Greece. That it is worth exploration is sufficiently evident from the fact that in antiquity it was a refuge for the most warlike and unsubduable tribes of Thrace; that it was the greatest and most sacred centre in Greece for the worship of Dionysus, holding, as it did, the famous Oracle of Dionysus; and, finally, that it was the centre of the gold and silver mining of Thrace, which had provided the sinews of war successively to Peisistratus and Aristagoras in the sixth century B.C., to Athens and the Athenian Confederacy in the fifth and to Philip of Macedon and Alexander in the fourth. In fact the very foundations of the Macedonian kingdom that Philip founded were laid on the increased revenue that he derived from the mines of Philippi at the foot of Pangæum.

Before 1912, when the whole region was part of Turkey in Europe, both the difficulties put in the way of travellers by the Turkish authorities and the dangers of leaving the beaten track made the whole region most difficult of access. From 1912 to 1914 the first and second Balkan wars involved the whole district in military upheaval. From 1915 to 1918 it fell into the area occupied by the forces of Bulgaria. Only now is it accessible in safety to the traveller. I found no difficulty in visiting the remoter villages of the plain and the mountain itself during the course of the spring of this year.

Mount Pangæum rises abruptly out of the flat and prosperous plain of Drama, and reaches a height of 6,142 ft. above the sea level. The eastern side of the plain is covered by a vast malarial swamp, which cannot be drained into the sea because of the low barrier of hills at the southern end that divide it from Kavalla and the coast. A certain amount of the overflow reaches Lake Tahinos in the Struma valley by way of the River Angista, but a large part of the plain is rendered useless for agriculture. It seems improbable that the swamp was so extensive in Roman times, for the site of Philippi is to-day almost under water. But if the Romans had drained the water into the sea, no trace of their workings has yet been found.[9] Above the plain the mountain rises in fine and shapely outlines, snow-capped for all except the summer months. The north side is bare, treeless, and unbroken by ravines. On the south and east it falls away in a series of enormous hollows that are filled with forests of beech and oak

[1] *Les Observations de plusieurs singularitez et choses memorables trouvées en Grèce.* (Paris, 1554.)

[2] *Voyage au Lévant* (La Haye, 1705), and *Voyage dans la Grèce* (Amsterdam, 1714).

[3] *Voyage dans la Macédoine.* (Paris, 1831.)

[4] *Travels in Northern Greece.* (London, 1835.)

[5] *Mission Archéologique de Macédoine.* (Paris, 1876.)

[6] Various articles in the Ἐπετηρὶς τοῦ Παρνασσοῦ, 1898, 1900, etc.

[7] Οἱ Φιλίπποι. (Constantinople, 1897.)

[8] *Les cultes du Pangée* (Nancy, 1912), and an article, "Scaptesyle," in *Klio*, x, pp. 1–27.

[9] A British company has now undertaken the drainage of the plain.

and, in the higher parts, of larch. The lower parts of the mountain are of crystalline limestone ; the summit is of pure white marble, with a thick grain similar to, and almost indistinguishable from, that of Parian. The ascent of the mountain, which requires two days, is best made from the village of Banitsa on the north side. Thence a path leads to the monastery of Eikosiphoinissis, which is built in a wooded hollow at a height of 1,200 ft., and overhangs the village of Nikisian on the east side. This monastery was built between the years A.D. 443 and 454, in the time of Sozon, Metropolitan of Philippi. A pure and plentiful spring flows out here and is said to have appeared at the founding of the monastery. From here the path ascends steeply along a ridge on the south-east face of Amphipolis and the line of the river clear and distinct. From the summit the same path is said to run on down the west slopes of the mountain straight into Amphipolis. Near the summit is another cave, small and shallow, known as Chionistra, and in it snow lies unmelted all the summer.

The villagers of Pangæum say that there are traces of old mine workings on the summit near Chionistra, on the lower southern slopes above Nikisian, and at a place near the village of Mosorop known as Asimotripi, or " Silver Holes."

Pangæum is known to the Turks as Pilaf Tepe, the " Hill of Rice," because of its snowy cone-shaped summit ; or Pirnar Dagh, because of the spring at the monastery. By the Bulgars it is called Gushnitsa.

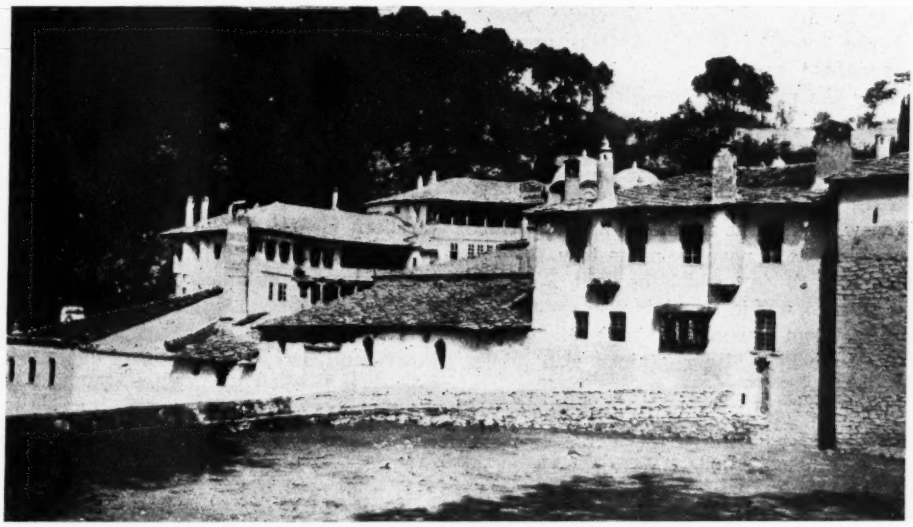

FIG. 2.—THE MONASTERY OF EIKOSIPHOINISSIS.

and passes an enormous cave known locally as Ascetotripo, or " Monk's Hole." The full extent of this cave I was not able to ascertain, but there were at least three large chambers in succession leading into the heart of the mountain. Beyond the cave is a wide extent of beech forest, the floor of which, in April, was covered in the more open parts with cowslips and wild lilies-of-the-valley, and on the outskirts of the trees with peonies and wild roses. The forest came to an abrupt end just below the snow-line, and the path emerged into a steep ascent known as Scala Denas. Perhaps in this name we can see a survival of the name of Dionysus, which is not otherwise preserved in the district. In and round the snow was a profusion of crocus, squill, and grape-hyacinth. The path to the summit bends round the northern face and commands a view of the whole of the Struma valley, with the site

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The Greeks retain or have revived the ancient name.

Where, then, were the gold and silver mines of antiquity and where was the Oracle of Dionysus ? Where did the tribes of Satræ and their priests of the Bessi tribe live, the people whom Herodotus says were never subdued by any man ?

The main problem of the gold and silver of Pangæum has yet to be solved. The problem, generally stated, is this. Mount Pangæum or the Pangæan area, that is to say, the mountain together with the Drama plain to the east, the Angista valley to the north, the lower part of the Struma valley on the left bank of the river to the west, and the rugged coast at the foot of the mountain on the south, is fixed by innumerable references in ancient authors as the greatest and most important mining area of the eastern Mediter-

ranean in ancient times. Our only evidence for the existence of mines on the mountain itself is Herodotus,[1] who says that Pangæum is " a large and high mountain in which there are mines of gold and silver. It is inhabited by the Pierians and Odomanti and principally by the Satræ." Euripides, in the *Rhesus*,[2] calls Pangæum " silver-bearing," and again the " gold-ored cliff Pangæum." [3] Strabo and other authors follow suit, and the general impression is given that the mountain itself was the main source of supply of the gold and silver of the area. But, on the other hand, all the most famous mines of the Pangæan area are not on the mountain. Scaptesyle, the most famous, the mine from which the historian Thucydides derived his wealth, acquired as the dowry of his Thracian wife, seems to have been on the coast. Stephen of Byzantium, in his treatise *Concerning Cities*, states clearly that the town of Scaptesyle was opposite Thasos. Herodotus [4] mentions the **Συλέος Πεδίον**, which was near the mouth of the Struma, a place-name which may be connected with the name of the mine. Perdrizet,[5] who suggests that this mine was situated near the site of the present monastery of Eikosiphoinissis, can adduce no ancient evidence to support his view, and I was unable to find any trace of ancient workings at or near the monastery.

The mine called Asyla,[6] which brought Philip of Macedon his revenue, was in the plain near Crenides or Philippi, as that town was subsequently called. The island of Thasos, which also contained rich mines, falls geologically into the Pangæan area. The Thasians owned other mines on the mainland, but we are nowhere told that these were on the mountain itself. There is an issue of gold coins inscribed with the name of the " Thasians of the mainland " which was probably struck from the gold of these mines. Where, then, were the mines of the mountain ?

In view of the fact that workings only of unimportant character and insignificant size have been found on the mountain itself, it seems unlikely that it was ever mined to a very large extent or that it was ever very productive to the direct operations of the miner. This seems borne out by the formation of the mountain, which is not of so metalliferous a nature in its upper levels as in its lower.

The whole question, however, of the nature of ancient gold and silver working is raised. Did the ancients understand how to extract gold from ore, or was ancient gold-mining confined to the collection of surface and alluvial gold ? In the case of silver the process of extraction from galena ores was simpler and certainly understood in antiquity up to a point, as the remains of the silver workings at Laurium in Attica indicate.

Perdrizet is of opinion that, in the Pangæan area at any rate, only alluvial gold or " placer " gold, as miners call it, was collected, and that the almost complete absence of gold in the Pangæan district to-day is accounted for by the fact that the " placers," as is invariably the case, became exhausted, and that, too, at an early date in antiquity. Certainly we hear little of Pangæan gold in Roman times. Even in the fifth and fourth centuries B.C. " placer " succeeded " placer," and while Scaptesyle was the popular centre in the fifth, so Asyla replaced it in the fourth century. Certainly Perdrizet's view is borne out by Strabo,[7] who says that " the peasants who plough the land in Pæonia are said to find nuggets of gold." This can only refer to alluvial gold.

Whether Perdrizet is right in his further assumption that the ancient world in general knew only of mining for alluvial gold is uncertain. There are many passages in ancient authors which seem to contradict this. In any case we must await the discovery of more ancient gold workings before we can accept such a generalisation. Neither Scaptesyle nor Asyla has yet been identified, chiefly, perhaps, because no one has yet set out to look for them according to the indications left by ancient authorities.

In general it seems probable that the mountain itself contained little gold that was accessible. On the other hand, from the veins and deposits that it contained, it is most likely that gold had been washed by constant erosion and deposited in the earth of the extensive plains at its foot by way of the numerous ravines that drain its sides. This was the Pangæan gold that was collected by the miners. The few workings on the mountain itself were probably undertaken, for the most part, to obtain silver, while the pyrites deposits were worked tentatively and unsuccessfully.

Of the Oracle of Dionysus we know all too little. What we do know is given by Herodotus and Euripides and in a few other occasional references. Herodotus [8] says that :

" These are the people [the Satræ] who possess the Oracle of Dionysus, which is on their most lofty mountains. Of the Satræ, those who act as prophets of the shrine are the Bessi ; a prophetess gives the oracles as at Delphi."

Euripides in his play, the *Rhesus* is vague. Rhesus, after his death, is said to live beneath the mountain as a semi-human deity (*anthropodæmon*), who served Dionysus as prophet. This has been taken to indicate that the Oracle of Dionysus was in a cave. According to the words of Herodotus quoted above, the

[1] vii. 112. [2] l. 970.
[3] l. 921. [4] vii. 115. [5] *Klio*, x, p. 26.
[6] Appian. *Bell. Civ.*, iv. 106. [7] Frag. 35. [8] vii. 111.

Oracle was in the more inaccessible parts of the mountain and not in the plain, for it was guarded by the Satræ and Bessi, wild mountaineers, whose peculiar charge it was. Pangæum was inhabited "principally by the Satræ," he says in a passage already quoted.

No remains of a building which can be identified with the Oracle have yet been found on the mountain, which is remarkable for the almost entire absence of signs of ancient habitation. It must be presumed that so savage and primitive a people as the Satræ controlled an oracle that was of a simple and elementary nature. It is generally believed now that the Satyrs of ancient mythology, who are the semi-human attendants of Dionysus, are to be derived by way of legend and art from these wild people of Pangæum. Their name itself seems to be the same. In the same way the ogres of fairy-stories are said to originate from some half-forgotten folk-memory of Palæolithic cave-men, and dwarfs and gnomes from old half-legendary people, as, for instance, the Picts.

So we shall probably not be far wrong in looking for the famous Oracle in some cave on Pangæum, possibly in the cave of Ascetotripo. Nothing to suggest the certainty of such an identification was visible in the cave when I saw it, but the accumulations of ages and the constant deposit of calcareous matter had rendered an examination of the soil impossible. The difficulty was increased by the depth and darkness of the cave. Only by excavation will it be possible to find out the purpose of the cave and the traces of its inhabitants. Few caves in Greece are empty of all traces of habitation, and many are sanctuaries. The Dictæan and Kamares caves in Crete and the caves of Pan on Hymettus and Parnes in Attica have all given up a rich store of antiquities to the excavator, and it is not unreasonable to hope for interesting discoveries from this Pangæan cave.

Of the Bessi, who seem to have been the sacred caste of the worshippers of Dionysus, we know more than of the Satræ. The tribe of Bessi is frequently mentioned throughout history from the time of Herodotus to the Christian era. "All these tribes," says Strabo,[1] speaking of the tribes of Thrace, "are most addicted to brigandage, but the Bessi, who for the most part live in Hæmus [i.e. the northern part of the Balkans], are called brigands even by brigands." It seems to have been a detachment or special caste of these Bessi of Hæmus who served Dionysus on Pangæum away from their northern home. Persian, Greek, and Roman alike left them unsubdued. As each invader came across the plains, they descended from the mountains, attacked his troops and transport, and withdrew unbeaten. Only in the Christian era are they said at last to have been led into the path of respectability. In the fourth century A.D. Bishop Nikitas of Dacia claims to have converted them: they are made the subject of a poem or congratulatory ode written to the bishop by his friend Paulinus[2]:

> Hard were their lands and hard those Bessi bold,
> Cold were their snows, their hearts than snow more cold;
> Sheep in the fold from roaming now they cease,
> Thy fold of Peace.

That the Satræ of Pangæum and the Satyrs of Dionysus are both the true natives of the mountain seems clear. All the beautiful silver coins of the towns and tribes in the immediate vicinity bear as types fantastic satyrs in a variety of attitudes and occupations. With them on many coins are nymphs, usually in the rôle of reluctant or protesting captives. There were no nymphs on Pangæum, and the Satyrs, like the savage mountain tribe that they were, raided the villages of the plain.

Such are the problems that cluster round the sacred mountain of Pangæum. Little has yet been found out and much remains to be done. It is no mere coincidence that Athos, the sacred mountain of Orthodox Christianity, rises to the south in Chalcidice and, towering higher than Pangæum, throws a challenge to the most pagan shrine of Paganism. Its status as a republic throughout the Turkish domination and its accessibility to travellers have made it known to the world just as Pangæum has remained unknown. While Athos has always been a refuge for the oppressed or ascetic Christian, Pangæum has never been more than a refuge for unruly tribesmen and, in more recent times, for brigands and outlaws who wished to escape the tax-collector, the army, and the police of the various races which have from time to time controlled this wild and barren coast.

The clue to much history lies in these northern provinces. To Athens in the fifth century Thrace and Macedonia meant as much as, and more than, they had been to the adventurers in the sixth. Her empire might have been consolidated and her wealth assured if she had concentrated all her efforts towards strengthening the bonds between herself and the Greek cities of the coast and towards increasing the influence she already possessed with the princes of Thrace and Macedonia. But she was induced to dissipate her strength in more distant regions, and to abandon any projects she may have formed for development in the north.

[1] Ch. 318.

[2] Translated by J. Harrison in *Prolegomena to the Study of Greek Religion*, p. 371. There are three more verses.

THE November DISCOVERY will contain articles on—*Inflation and Unemployment, The Fear of Death, The Second Mount Everest Expedition, The British Association's Meeting, Some Children's Games and Songs in Ancient Greece*, etc.

The First Voyage Round the World

By R. T. Clark, M.A.

FOUR hundred years ago, on September 6, a tiny ship of eighty-five tons cast anchor outside Seville Bay. She was much battered and damaged, her sails were patched and her ensign torn; but she could look down with pride upon the statelier galleons that passed her, for she had accomplished what no other ship had accomplished before her—the circumnavigation of the globe. Partly because of a certain absence of that dramatic element which surrounds the voyage of Columbus, partly because, no adequate record of it having been preserved, no historian has thought it worth while to make Magellan as famous as Columbus or Vasco di Gama, or even Cortez and Pizarro, and partly on account of national jealousy and over-patriotic historians, the man whose enterprise was, in Lord Stanley's words, "the greatest ever undertaken by any navigator"[1] is almost the least known of the great explorers.

Magellan, or, to give him his full name, Fernao de Magalhaes, was a Portuguese—the Spanish historians have never forgiven him for it—and was originally in Portuguese service in the Indies, where he greatly distinguished himself for personal courage and resource and was "always much wounded"; but, venturing to differ from the Governor, the imperious Albuquerque, fell from favour, and was refused employment at sea. On this he denationalised himself and became a Spanish subject—the Portuguese historians have never forgiven him for that—and succeeded in interesting Charles V in a project to reach the El Dorado of the Indies from the west to the great detriment of the Portuguese and the greater glory of the King of Spain. The royal interest was fruitful of result. On May 4, 1518, Charles signed a contract with Magellan by which five ships were placed at his disposal and an expedition prepared despite the protests of the King of Portugal.

On August 10, 1519, Magellan set sail with his little fleet, the *Conception* (90 tons), the *Victoria* (85 tons), the *San Antonio* (120 tons), the *Trinity* (110 tons), and the *Santiago* (75 tons).

"The ships of Magellan's fleet, Sire," reported the agent[2] of the Portuguese king to his anxious master, "are five. . . . They are very old and patched up: for I saw them when they were beached for repairs. It is eleven months since they were repaired, and they are now afloat and they are caulking them in the water. I went on board of them a few times and I assure your Highness that I should be ill inclined to sail in them to the Canaries because their knees are of touchwood. The artillery which they all carry are eighty guns, of a very small size: only in the largest ship, in which Magellan is, there are four very good iron cannon. All the crews they take, in all the five vessels, are 230 men, and they carry provisions for two years."

And so the King of Portugal was comforted, and concluded that with such an armament there could be no real threat to his possessions in the East.

Magellan had no historian with him; he was no writer himself, and if it had not been that there chanced to be on board two Italians, one anonymous but commendably concise, the other the Chevalier Antonio Pigafetta, gratefully loquacious, we should know next to nothing of the epic voyage. But from their narratives and a few supplementary documents it is possible to gather the events, if not the spirit, of it with tolerable accuracy. Passing Teneriffe and the Cape Verde Islands, Magellan struck south-west for the Brazilian coast, which he reached in December in the neighbourhood of Rio. Thence he proceeded down the coast in search of the desired channel that would take him to the East by way of the West. They passed the La Plata, and baptised it the river of St. Christopher and found delight—or rather the Vicenzan, Pigafetta, did—in the sights and sounds of Patagonia and its natives with their areca nut, their cannibal habits, and their great god Setebos, who took Shakespeare's[3] fancy as well as Pigafetta's. They even made friends with these tall savages and baptised them, having special fondness for an immense gentleman "so tall that the tallest of us only came up to his waist," whom they called John, and who "when he leapt caused the earth to sink in a palm depth at the place where his feet touched," and who "pronounced the name of Jesus, the Pater Noster, Ave Maria, and his name as clearly as we did; but he had a terribly strong and loud voice."[4]

They were now in unfamiliar and hostile waters made memorable and terrifying by previous disasters, and daily penetrating farther into the unknown Antarctic and the storms of the Horn. The strain began inevitably to tell on the crews. Few of them had any sense of loyalty to Magellan or sympathy with his enterprise, for already off Teneriffe there had been mutterings of mutiny. As Spaniards they disliked being commanded by a Portuguese, and, as few of them seem to have been of the stuff of which pioneers are made, they disliked still more the idea of being led to a miserable end in the frozen south. When they reached the "port of St. Julian" on the verge of the mysterious Antarctic, matters came to a crisis. Headed by three Spanish captains the malcontents

[1] Stanley (vide note on references at end of article).

[2] Ibid., p. 42.

[3] Ibid., p. 55. Cf. *The Tempest.*

[4] Ibid., p. 52.

" rose up against the Captain Major, the captains saying that they intended to take him to Castile in arrest, as he was taking them all to destruction." [1]

If they thought to terrify a veteran who had braved governors and faced perils in those very Indies which he was determined to reach, they sadly misjudged their man. With the help of some faithful Portuguese and other " foreigners," and the men of his own ship, Magellan had one of the leaders killed out of hand; five days later another was beheaded and quartered, and the remainder found it prudent to acquire new enthusiasm for exploration. That trouble over, Magellan prepared to continue his voyage, but had to face another mishap, as the *Santiago*, sent to explore the coast, went on the rocks, and her crew escaped only with great difficulty. Thus reduced in number, they at length got clear of St. Julian on August 24, 1520, after having " set up at the top of the highest mountain which was there a very large cross, as a sign that the country belonged to the King of Spain and given to the mountain the name of Mount of Christ," and after all had " confessed and received the body of our Lord like good Christians." [2]

Thus prepared for the worst, the little fleet crept slowly down towards the Horn. On October 21 they arrived off a cape, which for the sake of the day they named the Cape of the Eleven Thousand Virgins. After sailing two or three leagues onwards, they found themselves at the mouth of a strait, and here amid much excitement they anchored.

An exploring party sent out reported that there were three channels. The fleet moved up to where the channels separated and again cast anchor. The *San Antonio* and *Conception* were sent on to search the channels, but in the darkness the crew of the *San Antonio* mutinied, flung their commander, Alvar de Meschite, Magellan's cousin, into chains, and, slipping past the others, made incontinently for Spain. The *Conception*, missing her consort, fluttered aimlessly about until Magellan, receiving no word from either scout, came on himself, and, picking her up, pushed on through the channel till night fell, when he anchored again. He sent the boats out and followed with the ships, and the boats reported that there was an outlet, for they could see the great sea on the other side. Magellan immediately ordered all his artillery to be fired, and, amid rejoicings and congratulations, the three tiny vessels sailed proudly into the unsailed waters of the South Pacific.

The object of the journey had been attained. It had been proved that the American continent was not an insuperable barrier to ships sailing west; it remained to prove that there lay on its western shore no obstacle to prevent ships reaching the Indies. On the other side of the Straits of Magellan the fleet was in even more unfamiliar waters than when it was descending towards the Land of Fire. But success tells. The discovery of the south-west passage had vindicated the expedition's leader and justified all the risks he had taken. There was no more talk of mutiny as the three ships steered light-heartedly westward to widen the empire of the King of Spain, although their crews were to suffer hardships far greater than any they had suffered in the Atlantic.

November 28 saw them in the open sea, where they " remained three months and twenty days without taking in provisions or other refreshments, and we only ate old biscuit reduced to powder and full of grubs and stinking from the dirt the rats had made on it when eating the good biscuit, and we drank water that was yellow and stinking. We also ate the oxhides which were under the mainyard so that the yard should not break the rigging: they were very hard, and we left them for four or five days in the sea and then we put a little on the embers and so ate them: also the sawdust of wood and rats which cost half a crown each; moreover enough of them were not to be got." [3]

Nineteen of the crews died from scurvy, and over thirty were seriously ill during that run of 4,000 leagues before they touched land, for with singular ill-luck the route that Magellan believed led most quickly to the Indies took them out of sight of island after island of the Pacific archipelago. There might have been tempests and storms, but the ocean was rightly named, for they had good weather continuously until they struck land on January 24 in the Paumatu group. On March 6 they reached a group of islands whose people were " poor, ingenious, and great thieves," and they therefore named the group the Ladrones. Thence it was a straight run to the Philippines—the domain of the Portuguese monopolists. In the Philippines they made friends with the natives, for, after all, it was here that the commercial business of the voyage began, and on Cebu, where Magellan was so popular that " he did what he pleased with the consent of the country, in one day 800 people became Christian, on which account Magellan desired that other kings neighbours to Cebu's should become subject to him who had become Christian." [4]

The heathen, however, proved hard of heart, so Magellan proceeded to burn down their villages and then to demand war indemnities. Hardness of heart persisted, and when, on April 23, Magellan arrived with some fifty men to enforce his demand he found himself opposed by a force of about 4,000 savages. Nothing daunted, Magellan disembarked at daylight,

[1] Stanley (vide note on references at end of article), p. 3.
[2] Ibid., p. 57.
[3] Ibid., p. 64.
[4] Ibid., p. 12.

and, leaving a guard on his boats, advanced inland with forty-nine men, only to be attacked by 1,500 islanders in three squadrons, who assailed them on front and flank. Volleys from musketeers and crossbowmen did not stop the islanders, nor did a diversion in the form of an attempt to burn the villages succeed any better.

"They came down upon us with the greater fury. The captain had his right leg pierced by a poisoned arrow, on which account he gave orders to retreat by degrees. We were oppressed by the lances and stones the enemy hurled at us, and we could make no more resistance. Retreating little by little and still fighting, we had already got to the distance of a crossbow-shot from the shore, having the water to our knees, the islanders following and picking up the spears which they had already cast, and they threw the same spear five or six times: as they knew the captain, they aimed specially at him and twice they knocked the helmet off his head. He, with a few of us, like a good knight remained at his post without choosing to retreat further. Thus we fought for more than an hour, until an Indian succeeded in thrusting a cane lance into the captain's face. He then, being irritated, pierced the Indian's breast with his lance and left it in his body, and, trying to draw his sword, he was unable to draw it more than half-way on account of a javelin wound which he had received in the right arm. The enemies, seeing this, all rushed against him, and one of them with a great sword like a great scimetar gave him a great blow on the left leg which brought the captain down upon his face; then the Indians threw themselves upon him and ran him through with lances and scimetars so that they deprived of life our mirror, light, comfort, and true guide. . . . This fatal battle was fought on April 27, 1521, on a Saturday: a day which the captain had chosen himself because he had a special devotion to it." [1]

With great difficulty Pigafetta and the others, leaving the body of their leader in the hands of the enemy, managed to get back to their ships and the "Christian king" of Cebu with the sad news. The survivors, having with some difficulty and loss foiled a plan of the "Christian king" to exterminate the lot of them, left the scene of their disaster to sail on westwards. They were now too few to man three ships, so off Bohol they burned the *Conception*, and, having touched at Borneo, sailed over the Celebes Sea. On November 6 they sighted the Moluccas, the lure of which had drawn Magellan from Seville to his death, and "we gave thanks to God and to comfort ourselves discharged all our artillery. It need not cause wonder that we were so much rejoiced since we had passed twenty-seven months less two days always in search of Maluco, wandering for that object among the immense number of islands." [2]

They landed at Tidore, where they had hoped to find a Portuguese adventurer named Serrano, a relative of Magellan, whose letters had been one of the inspirations of the latter's quest; but he was already dead, a victim to native treachery. But they found a European, the Portuguese de Lorosa, who had helped to discover the islands ten years before and had taken upon himself the duty of trying to intercept and destroy Magellan's fleet ere it reached the Indies. This was a reminder that they were now in hostile waters, although the Portuguese were in no great strength east of Singapore. But west of that the enemy were both equipped and prepared, and they learned to their great apprehension that squadrons were cruising off the Indian coast and off the Cape of Good Hope with express instructions that none of the Spaniards who had sailed into the King of Portugal's waters were to be allowed to return to Spain. On December 11 they prepared to leave Tidore, but found that the *Trinity* had sprung a leak. So they left her there with her crew, and the tiny *Victoria*, the sole survivor, went on her lonely way. Past Timor they sailed, and, leaving Sumatra to the north, steered straight across the Indian Ocean towards the Cape of Good Hope. Long before the journey was accomplished the crew were in a parlous state. The ship was making water and the weather was bitterly cold, while they had nothing but rice and water for food. For nine weeks they remained off the Cape delayed by westerly gales, but at last on May 9, 1522, succeeded in rounding it, and then for two months sailed northwest. On July 9 they reached the Cape Verde Islands and had to touch at one of them, where they were amazed to discover, like Jules Verne's hero, that it was Thursday, while with them it was only Wednesday. At last, concludes Pigafetta, "on Saturday the 6th of September of the year 1522, we entered the bay of San Lucar and of the sixty men who composed our crew when we left Maluco we were reduced to only eighteen, and these for the most part sick." [3]

Thus ended the greatest voyage the world has ever seen—a voyage most of the incidents in which have been lost to history for want of an expert chronicler. Little, too, is known of its remarkable leader, and only at the end of recounting a great career does even

[1] Stanley (vide note on references at end of article), p. 101.

[2] Ibid., p. 124.

[3] Ibid., p. 162. Eighteen is Pigafetta's figure, but others who had been arrested by the Portuguese at Cape Verde returned later (vide Stanley, p. 175, and Markham, p. 25). The captain of the *Victoria* was a Spaniard, Juan Sebastian del Cano. He was originally master of the *Conception*, and took part in the mutiny at St. Julian. He was pardoned and was elected captain of the *Victoria* in the Philippines. He died on an expedition in 1526.

the loquacious Pigafetta break silence concerning the personality whom he obviously loved so well. Remembering that blood-stained beach he cannot restrain himself, but breaks off his narrative to address himself directly to his patron, the famous Grand Master of Rhodes, Villiers de l'Isle Adam :

"He died : but I hope your illustrious Highness will not allow his memory to be lost, so much the more since I see revived in you the virtue of so great a captain, since one of his principal virtues was constance in the most adverse fortune. In the midst of the sea he was able to endure hunger better than we. Most versed in nautical charts he knew better than any other the art of navigation, of which it is a certain proof that he knew by his genius and his intrepidity without anyone having given him the example how to attempt the circuit of the globe which he had almost completed." [1]

Many men have had a worse epitaph : few men have deserved a better.

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Some additional information will be found in *Early Spanish Voyages to Magellan's Strait*, edited by Sir Clements Markham (Hak'uyt Society, 1911). There is also a *Life of Magellan*, by F. H. Guillemard (London, 1890). See also the article *Magellan* by Prof. Beasley, in the *Encycl. Brit.* (11th edition, vol. xvii, p. 302).

The Antiquity of Man in America—I[2]

By E. N. Fallaize, B.A.

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AMERICA has always been a centre of interest to the student of man and his culture. The highly developed civilisation of the central area has been the subject of many theories, fantastic and otherwise, while the origin of the American race—a race lauded as the noblest or vilified as the basest of mankind according to the prepossessions or prejudices of early writers—was a puzzle which for long was the subject of conjecture. In the circumstances it need hardly be said that the original stock has not failed to be derived from the ubiquitous Ten Tribes of Israel. In the early days of discovery the Indians were held to be outside the pale of humanity because they were not mentioned in Holy Writ ; while a more lenient view regarded them as the descendants of the Canaanites expelled from the Holy Land by Joshua.

In considering the origin and antiquity of man in America and the relation of this problem to the question of the evolution of the human race, there are, broadly speaking, three problems which present themselves for consideration :

1. What was the origin of the American-Indian population found by the Spanish explorers on their arrival and as it exists to-day ? Was this population aboriginal or was it immigrant ? In the latter case, when and whence did it arrive ?

2. What degree of antiquity can be assigned to the existence of man on the American continent ?

3. If a high degree of antiquity can be assigned to man in the New World, and if we accept the view which derives all races of men from a single origin, does the evidence point to an origin in the Old World, from which early man in America is an offshoot, or, *vice versa*, was the old world stock derived from America ?

Interest in these questions, upon which there had come to be almost a general agreement among a majority of anthropologists, has again been aroused by the discovery of a fossil tooth of an early human or sub-human type in the Upper Snake Creek beds of Nebraska. The tooth was forwarded to the American Museum of Natural History by its finder, Mr. Harold L. Cook, of the United States Geological Survey, and is described by Professor Henry Fairfield Osborne in *American Museum Novitates* of April 25 last. It has been pronounced by two eminent authorities on fossil teeth, Drs. W. D. Matthews and W. K. Gregory, to belong to a hitherto unknown species more nearly resembling *Pithecanthropus erectus*, the ape-man of Java, and man than the apes. *Pithecanthropus erectus* is now regarded by most competent authorities as definitely within the human family, and, up to the present, has been held to be its earliest representative. Although it was at first assigned to the Upper Pliocene, the last phase of the Tertiary period, it is now considered to belong to the Pleistocene, the first period of the Quaternary Age, immediately preceding geologically recent times. As the Upper Snake Creek beds belong to the Upper Pliocene, both the geological and the morphological evidence suggest that in this tooth we have a relic of the earliest and most primitive member of the human family yet known.

It will immediately be apparent that this discovery, should further investigation bear out the estimate of its early character, has a bearing of immense importance on the general problem of the origin and antiquity of man, as well as on the history of the human race in

[1] Stanley, p. 102.

[2] For the order of the geological ages mentioned in this article the reader is referred to the table illustrating Professor Wegener's article in DISCOVERY for May last.

America. To appreciate fully, however, the relation of this latest discovery to the views now generally current and its meaning and place in the scheme of our knowledge of the line of human development, some familiarity with the American evidence as a whole is essential.

The reader need not be invited to consider here theories of the origin of American culture—though an important feature in certain aspects of the problem—but to confine his attention to the evidence afforded by those skeletal remains to which high antiquity has been attributed. For the sake of clearness in the argument, however, it is most convenient to deal at the outset with the first of the three problems mentioned above.

It is now generally agreed, firstly, that the Indian in all the varieties in which he exists to-day on the American continent (barring the more distantly related Eskimo) exhibits certain common physical characteristics such as (1) skin-colour, (2) character, distribution, and growth of hair, (3) colour of the eye, and (4) the fact that the eye is usually set slanting upwards in the outward direction, in which he agrees to such a degree with the peoples of Eastern Asia and Polynesia as to suggest the conclusion that he derives from the same stem; secondly, that he represents an intrusion which came from Eastern Asia and spread over the continent from the north-west; and, thirdly, that this intrusion did not take place in the form of a migration, but in a series of waves after the stock had reached a stage of development superior to that of the latest Pleistocene man in Europe and had acquired certain characteristics differentiating it as a type, in effect, as clearly as those which mark the stock to-day. As regards the date of this intrusion, some would place it at the later Pleistocene at a time when Asia and America were joined by a land bridge at a latitude extending southwards to at least somewhere about what is now Alaska; other authorities would make it as late as early "recent" times, holding that it would be possible to cross from the one continent to the other by passing from one group of islands to another over water and ice without the assistance of a complete land bridge. The how and when are of less moment for the present purpose. The important point is that if it be accepted that the existing American Indian type is derivative in comparatively recent times from Asia, the investigation of the date and place in human evolution of the remains for which a high antiquity is claimed, is no longer hampered by the necessity of establishing a relation between the early and the modern types. At the same time, as will be seen later, resemblance to a modern type becomes a conclusive, and sometimes is the only, piece of evidence afforded by a discovery of human remains which gives a clue to their age.

The question of date rests upon geological and palæontological evidence. Before proceeding to examine specific cases in some detail, it may be said that the geological conditions, in the northern half of the continent at any rate, conform on general lines to the conditions prevalent in the Old World. The evidence points to an Ice Age with four periods in which there was an advance of the ice-sheet and with milder periods intervening. These correspond to the four cold periods with milder interglacial periods now very generally accepted as representing conditions during the Ice Age in Europe. In both cases the problem is to determine the relation of the evidence for man's existence to these periods of glaciation and interglaciation; but, whereas in Europe the question resolves itself into the interpretation of data which are established with a reasonable amount of certainty, in America, unfortunately, the data are either entirely lacking, or are themselves in dispute. Lack of scientific method in recording exact details of the circumstances and conditions of discovery has deprived them of much of their value as evidence. In the earlier finds precise geological data are rarely to be had, and, even where such data are forthcoming, no observation was made as to whether the stratum containing the skeletal remains was undisturbed. In other words, we have no means of determining whether the position of the human remains discovered was due to deposition at the same time as the stratum in which they were found to be lying, or was the result of a later introduction by human action (i.e. interment) or by natural forces such as a flood or "wash out."

Turning to the finds in detail, fourteen discoveries of human remains in North America have been recorded in which the circumstances appeared at first sight to warrant a claim for a high antiquity. Of these, the more important are as follows:

In 1844 a complete skeleton was found in New Orleans, Louisiana, in the course of excavations for gas-tanks at a depth of 16 feet, under the roots and stumps of no fewer than four successive growths of trees standing at different elevations. On this basis it was calculated that "the human race existed in the Delta [of the Mississippi] more than 57,000 years ago." The bones, apparently, were not fossilised, nor does the description of them suggest an essentially primitive type; but they have not been preserved.

A claim for antiquity based upon the evidence of the growth of trees was also made in the case of the skeleton from Soda Creek, Colorado, which was found in 1860 at a depth of 20 feet under gravel which was being mined for gold. There is little doubt that this was an intentional burial.

In 1847 a pelvic bone was found at the base of a high cliff near Natchez, Mississippi, at least 2 feet

below skeletons of species of mastodon and megalonyx. This association with extinct mammals was taken to indicate a remote date. Sir Charles Lyell, who personally examined the locality, was of the opinion that the human bone came from a burial at the top of the cliff, whereas the remains of the extinct mammalia had been dislodged from a lower position. The bone has been pronounced to differ in no respect from the corresponding bone of recent man. A find of human bones associated with those of the mastodon at Charleston made in the sixties is discounted by the presence of a fragment of porcelain.

Fossilised human remains have been found in more than one locality in Florida, notably at Lake Munroe in 1852 or 1853, and at and in the neighbourhood of Osprey in 1871 and succeeding years. Further investigation has shown that the type of fossilisation exhibited by these remains may take place within a comparatively short period and affords no criterion of great age.

The most important of the earlier finds, and one which attracted very considerable notice at the time, was the Calaveras Skull, found in 1866 at Bald Hill, near Altaville, Calaveras County, California, in auriferous gravel dating from the Middle Tertiary period, in a mine-shaft at a depth of about 130 feet from the surface. It is a male skull of an individual of advanced years, and is of an intermediate type between long and broad. The forehead is of medium height, but not sloping, as in most skulls of low form. The eyebrow ridges are strong, but not especially prominent. A comparison with the skull of a Digger Indian from Calaveras County led Dr. G. A. Dorsey to the conclusion that the two skulls had the same general character and might readily be pronounced to be of one and the same type. The Calaveras Skull also corresponds in all essential features with a cranium from a cave in the same county which was presented to the National Museum in 1857. The body of evidence in favour of the geological antiquity of this skull is of greater weight than in the case of any other find; but the balance of probability, taken in conjunction with its resemblance to the cave skull mentioned above, which is "recent," and the fact that the considerable number of implements, etc., found in similar circumstances conform to the normal Indian types of stone implements, must be taken as against any very remote date.

A discovery to which much importance has been attached, both on morphological and on geological grounds, was made in 1866, when a skull and lower jaw were found at a depth of 3 feet in a fissure at Rock Bluff on the Illinois River in drift material of the region consisting of clay, sand, and broken stone, the whole covered with a stratum of surface soil. It was held in 1867 that the skull was not comparable to any of the aboriginal American cranial forms, while its position pointed to an antiquity, possibly, of the glacial epoch. For the latter conclusion, however, there was very little evidence, and there can be little doubt that the deposit in which the skull was found had been washed into the rift. The morphological evidence was its apparently low type and greatly developed supraorbital (eyebrow) ridges. Dr. Hrdlička, who has made a careful examination of the skull, points out, however, that this development is not comparable to that characteristic of the Neanderthal man of Europe in the early Palæolithic Age, but belongs to the type of supraorbital ridge found in some Indian skulls from the Illinois River mounds. It cannot, therefore, be regarded as evidence for geologically early man.

Of all these finds of skeletal remains, with the possible exception of the Calaveras Skull, the most interest attaches to the crania found at Trenton, New Jersey, where the conditions in certain respects approximate more nearly to those under which vestiges of early man have been found in Europe. The district is rich in deposits of glacial gravels, and for nearly forty years the Delaware Valley has been subjected to a close scrutiny with a view to determining whether man was present there before the advent of the Indian. Although many were inclined to regard the implements found as of late-glacial or immediately post-glacial date, Professor Putnam, who carried on careful investigations for a great number of years, suspended judgment, while Dr. Hrdlička, who subjected the osteological material to a careful examination, was definitely of the opinion that, with two exceptions, the crania were to be regarded as Indian in type. The two exceptions, the Burlington Skull and the Riverview Skull, could not be referred to any known aboriginal race. Both skulls are of a peculiar and similar type, unusually low, with narrow face, though the cranium is broad. Apart from other differences, which appear in the detailed measurements, the small height would be sufficient to differentiate these skulls clearly from the Indian type. As no other skulls of this type are known to have been found in America, they have been attributed to a race earlier than the Lenape Indians of the Delaware Valley, but Dr. Hrdlička is inclined to regard them as later immigrants, possibly Dutch, and compares them to certain skulls from Bremen, of similar dimensions, which have the lowest height-length index in the world. These skulls have been regarded as belonging to a distinct ethnic type persisting along the coast of N.W. Europe and exhibiting some resemblance to the Neanderthal race.

A find to which much importance was attached is that of the Nebraska "Loess man." In 1894, during some excavations on a low eminence known as Long Hill, about 3 miles north of Florence, near the

Missouri, a skull was found at approximately 5 feet below the level of the surface. Attention was not called to this find until 1906, when Mr. Gilder of Omaha, in exploring the mound, found a number of crania and other bones situated at different levels. Of these, some were found beneath baked clay, upon which at some time a fire had been built. The greatest depth at which any human bone was found was 11½ feet below the surface. It would appear that a lower stratum of skeletons had been placed in the mound feet inward, and earth had been piled on top and burnt hard. At a higher level, but some 5 feet distant, was an upper layer of skeletons which, with three exceptions, had been disarticulated and the bones more or less scattered. They were well preserved, but heavy and brittle. According to one view, the bones on the upper level represented a secondary burial. Below these was an undisturbed layer of loess[1] in which were found the greater number of the skulls. It has been held that these bones at the lower level represented deposition and not burial, and that they were therefore synchronous with the loess formation in which they were found. The antiquity of the remains, it was further argued, was supported by the character of the skulls, which were regarded as of the Neanderthal type, as they had thick protruding brows, low forehead, thick skull walls, and small brain capacity. It was suggested that they held an intermediate position between Neanderthal man and the mound-builder type of North America.

On the other hand, it has been pointed out that the occurrence of eight or nine bodies in such close proximity pointed to burial rather than to deposition by natural forces. Further, the custom of building a fire on earth placed over the bodies is an occasional feature in the burial mounds of this region. The difference of level at which bones were found in the lower stratum has been explained as due to the burrowing of rodents, of which traces are evident in the mound. The absence of fossilisation in the bones would be difficult to explain were the bones really of the date claimed for them. Dr. Hrdlička is of the opinion that the presence and similarity of position of knife-marks on the edges or margins of the bones—in nearly all cases the long bones and the skull—indicates a custom such as that of cleaning the bones after disinterment as a preparation for secondary burial, while he has shown that the resemblance to Neanderthal man occurs in remains from Indian mounds in the same region as that in which the Nebraska Loess man was found.

[1] Loess: a deposit of glacial age, consisting of wind-driven and sifted sand or soil, the result of denudation. It is the product of a period of cold, and in a subsequent warm period of moisture which accompanies the melting of the ice-cap is deposited as clay, brick-earth, or mud.

An adult skeleton and a portion of the jaw of a child were found at Lansing, Kansas, in 1902, in a terrace at the foot of a bluff on the banks of the Missouri, at a depth of 20 feet below the surface, the remains being separated by a distance of about 70 feet. They occurred in an undisturbed loess-like belt which presents great variety of composition and considerable irregularity of accumulation. The site was examined by many prominent geologists; but opinion as to the geological age of the deposits remained divided, some regarding them as true loess, while others judged them to be of a much more recent age, and not laid down in glacial times. Measurements of the bones of the skeleton of the adult, which belonged to an individual of about 55 years of age, were practically identical with those of the present-day Indian of the Middle and Eastern States. In default of a clear pronouncement on the geological question the verdict on this important find must, in the light of the osteological evidence, be against a high antiquity.

From this summary account of the more important of the skeletal remains which have been regarded as belonging to early man, two conclusions emerge. Firstly, that no satisfactory evidence of geological antiquity has been adduced, the geological data being absent, or failing either to support the claim to antiquity or, otherwise, to substantiate the undisturbed character of the deposit in which remains have been found. Secondly, that these early remains in themselves exhibit none of the morphological differences which would undoubtedly be found to exist between a skull of remote antiquity and that of the Indian—a race, it is agreed, of recent introduction. In the case of possible exceptions, as, for instance, the Calaveras Skull and the Missouri skulls, it has been shown that, while they differ from the normal Indian skull, they conform in each case to a variant of that type.

(To be concluded in the November Number.)

The Geology and Fossil Plants of West Greenland

By A. C. Seward, Sc.D., F.R.S., Pres.G.S.

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FROM the granitic headlands of Cape Farewell, on the latitude of the southern extremity of the Shetland Islands, Greenland extends slightly beyond lat. 83° N.; it is nearly 1,700 miles long, a distance equal to that from the northern limit of the Shetland Islands to the north coast of Africa, and has an average breadth of about 600 miles. On the north-west Greenland is

separated from Grant Land, Grinnell Land, and Ellesmere Land by the narrow channels connecting Baffin's Bay with the Polar Sea: so narrow are the channels that Eskimo can easily pass across. It was doubtless by this route that the ancestors of the present Greenlanders reached the country. With Europe Greenland is closely connected geologically. In the remote past, at least, there was probably a vast continent, a northern Atlantis, stretching from what are now the highlands of Norway and Scotland to the Arctic regions of America. Greenland is in a geological as also in a biological sense a connecting link between the Old and New Worlds. By far the greater part of the island, so far as it is possible to ascertain the structure of a land almost completely covered by ice, consists of coarsely crystalline rocks mainly of igneous origin and of an antiquity that is inconceivably remote. The cliffs on some parts of the coast are built up of limestones, sandstones, shales, and old pebble beaches containing the remains of animals and plants characteristic of several geological periods and clearly indicating climatic conditions within the Arctic Circle much more genial than those at the present day. Even in the extreme north, on the shore of the Polar Sea, limestone rocks have been described by the Danish geologist Koch as "veritable coral reefs" of the Palæozoic era, the fourth era in geological time.

Greenland is a mountainous plateau mainly composed of some of the oldest rocks in the world belonging to a stage in the history of the earth (the Archæan period) which is shrouded in mystery. Of the life of this period we have no certain knowledge. On the extreme northern coast, also at many places on the east and west coasts, the presence of thick series of ancient sediments and of rocks consisting of accumulated masses of the calcareous skeletons of marine animals is evidence of recurrent subsidences of the land and the submergence of its edges. The occurrence of terraces of sand and gravel at a height of from 200 to 300 feet above the present tide-level, containing marine shells of species still living in the Arctic seas, denotes an upward lift of the coast-line in comparatively recent times. A still more recent movement, but in a downward direction, is demonstrated by a comparison of a series of photographs, taken over a period of several years by a Danish geologist, which shows that the tangled mass of brown seaweed which clings to the foot of the cliffs at low water is slowly creeping upwards. The fact that iron rings for ships' cables fastened into the rocks on the west coast are exposed only at low tide is confirmatory evidence that, on the west coast at least, Greenland is sinking.

Seen from the sea the coast of Greenland forms a long line of mountains often reaching a height of from 3,000 to 4,000 feet, the darker blue of the nearer hills shading gradually up the deep and tortuous fjords into the lighter tones of those farther inland. Off many parts of the coast lie scattered groups of islands, or skerries, like huge round-backed whales, the ice-worn summits of a submerged mountain range. Over the whole of the interior is the "dead storm-lashed desert of ice," rising in the central regions to a height of 8,000 to 10,000 feet, its surface thrown into gentle undulations and the monotony occasionally broken by a stream that plunges with a roar into a

FIG. 1.—A DYKE OF BASALT FORMING A RIDGE ON A HILL OF LIGHT YELLOW SANDSTONE.
Blocks of sandstone hardened by the dyke are seen on the left-hand side of the darker basalt.

chasm of unknown depth. Fridthof Nansen, who in 1888 was the first to cross Greenland, compared the inland ice to the gently sloping surface of a shield hundreds or even many thousands of feet in thickness. From the inland ice glaciers, like mighty tentacles, are thrust outwards towards the sea, and as the ice reaches water deep enough to buoy up the moving mass portions are broken off as icebergs. One of the most prolific berg-forming glaciers on the west coast stretches across the head of the Jakobshavn Ice Fjord (lat. 69° N.). It has been calculated that the daily discharge of ice through this ice fjord amounts to 432,000,000 cubic feet. The surface of the water as seen from the hummocky coast behind Jakobshavn is a continuous mass of icebergs, some floating, some stranded, all huddled together in disorderly array, suggesting the fall of a stupendous avalanche into the waters of the fjord. At the western end of the fjord the icebergs set out to sea drifting, it may be, many

hundred miles before they melt or come to rest on the shore of Newfoundland or even farther south, breaking up like ships aground.

The fossil-bearing rocks it was our aim to investigate during the summer of 1921 are exposed along the shore and in the ravines of Disko and other islands, and especially on the Nugssuaq peninsula. Most of

FIG. 2.—A VIEW NEAR GODHAUN

Showing part of the high basaltic plateau of horizontal beds of lava and ash and, below the snow-covered talus slopes, the darker hummocks of Archæan gneiss; grasses on the sandy beach in the foreground.

them were deposited during the Cretaceous period; others are Tertiary in age.[1] Slabs of rock detached with the aid of a pickaxe from the side of a ravine where the hills are made of a succession of sheets of sediment—the sands and muds of some ancient lake or lagoon—are found to be covered with the clearly outlined impressions of large leaves like those of the Plane or Tulip tree, fronds of ferns hardly distinguishable from species (of the genus Gleichenia) living to-day in tropical and sub-tropical countries, twigs and cones of Conifers, some of which are almost identical with those of the Mammoth tree (*Sequoia gigantea*) now confined to a narrow strip of the Californian coasts, and massive stems of forest trees. None of the leaves preserved in the Greenland rocks have a greater fascination for the student of the past history of living plants than those of the genus Ginkgo. This genus is now represented by a single species, the Maidenhair tree (*Ginkgo biloba*), which is sometimes said to occur in a wild state in China, though it is probable that even in China and Japan, where it grows abundantly, it exists only as a cultivated tree associated in the Oriental mind with some religious symbolism. Some of these fossil leaves are indistinguishable from those of the sole survivor of this ancient genus at several localities within the Arctic Circle as in many other regions of both the Old and New World; and their preservation strikingly illustrates the possibilities, offered by a study of the records of the rocks, of connecting the present with the past, of following the wanderings over the world and of tracing the rise and fall in their fortunes, of still living members of the plant kingdom.[2]

These fragmentary relics, "the ghostly language of the ancient earth," suggest problems that are more easily stated than solved. Two among the problems which exercise the ingenuity of geologists and botanists may be mentioned: if, as seems certain, the climate of Greenland was warm enough to support a vegetation, including forest trees and other plants closely related to species now growing in warm temperate and sub-tropical districts in North America, southern Europe, China, and elsewhere, what were the causes for the change to the present conditions? Of the plants that exist in Greenland some occur also in different parts of Europe, others have their nearest relatives in North America. Where was the original home of the Arctic floras, and what was their fate during and subsequent to the Glacial period which reduced North America and North and Central Europe to much the same condition as that of Greenland to-day? Much has been written on the causes governing climatic changes in the past; but the question is still under discussion. Mr. Porsild, the Director of the Danish Arctic Station, has recently summarised the views of botanists on the origin of Arctic floras and on the effect of the Glacial period on the pre-glacial vegetation: he believes that the Ice Age was fatal to the vegetation and that the present plant population of the country arrived across Smith Sound on the north-west and spread over the ice-free fringe of Greenland.[3]

Thomas Hardy in *The Return of the Native* speaks of Clym Yeobright walking alone on the heath "when the past seized upon him with its shadowy hand, and held him there to listen to its tale. His imagination would then people the spot with its ancient inhabitants." Similarly the waifs and strays from the vegetation of the past enable us with a certain degree of accuracy to reclothe the hills with plants of other days and other climes. It is impossible with precision to interpret in degrees of temperature what the buried leaves and twigs indicate; but we may safely say that they belong to plants which could not have existed under conditions comparable to those endured by the present Arctic vegetation.

Many of the localities visited were on uninhabited coasts where the land rose gradually inland for a few

[1] The Cretaceous period is the first period in the Mesozoic or Secondary era. This era is the third oldest in geological time, being directly preceded by the Tertiary. See DISCOVERY, vol. iii, No. 29, p. 115.

[2] For a fuller account of Ginkgo and other survivals, see *Links with the Past in the Plant World*, by A. C. Seward. (A volume of the Cambridge Manuals of Science and Literature.)

[3] Mr. Porsild's article is in a comprehensive work on Greenland recently published in Copenhagen. (*Grønland*, 2 vols. Edited by G. C. Amdrup and others. Copenhagen, 1921.)

hundred yards, then the gradient rapidly rose up the face of a mountain. Deep ravines laid bare a succession of sedimentary strata 1,000 feet or more in thickness, over which had been piled layer after layer of lava-flows and beds of volcanic ash. The widely spread sheets of basalt (in some places as many as thirty superposed layers), which give a terraced appearance to the weathered face of the cliffs like that of the rocks of Mull and other islands off the west coast of Scotland, are proof of long-continued volcanic activity on a stupendous scale. The photograph (Fig. 2), taken near the Arctic Station on Disko Island after a recent fall of snow, shows very clearly the layers of lava and ash above the talus slopes.[1] The darker rocks in the foreground belong to the much more ancient crystalline series which forms the greater part of Greenland. Another expression of volcanic phenomena is seen in the numerous dykes which frequently cut across the beds of sandstone and shale. A dyke consists of some igneous rock, often basalt, that has been forced from below through cracks and fissures in the overlying strata. The softer rocks fall an easier prey to the action of the weather than the harder and more compact dykes, which are left as great ribs or dark-brown buttresses projecting on a light-yellow background of less resistant material. Part of a dyke of dark-brown basalt is seen at close quarters in Fig. 1; it resembles a partially ruined wall on a wind-worn denuded field of sand, the result of disintegration of beds of soft sandstone. Here and there adhering to the sides of the dyke are blocks of sandstone which were hardened and rendered more resistant to denuding agents by contact with the molten rock which welled up against their fissured sides.

From the beds of shale exposed in the cliffs on the south coast of Upernivik Island (lat. 71° N.) above the beach, littered with boulders, several impressions of fossil plants were collected, including pieces of the large fronds of a Cycad, a plant related to the so-called Sago Palms, the majority of which flourish in the Tropics. An almost vertical dyke thrust through the old sediments forms a prominent feature on the left (Fig. 3). The two massive mountains in the distance are portions of the highlands, bordering the western edge of the Umanak fjord, composed of some of the oldest rocks in Greenland. One of the most striking mountains in Greenland, recalling in shape the Matterhorn, rises almost sheer from the sea as a wall of igneous rock nearly 4,000 feet in height on the small island of Umanak off the north coast of the Nugssuaq peninsula. The salmon-pink mass is cut across halfway up the precipice by a thin black band bent on itself like an S lying on its side, an eloquent witness to the intensity of the forces which folded and crumpled the rocks of which the Umanak mountain remains as a detached and magnificent bastion that in the course of ages has been fashioned into its present form. Near the base of the cliff is the settlement of Umanak with the native huts and timber houses built on the small level patches among the rounded hummocky rocks which form a massive plinth to this pyramid that dominates the island.

One of the best localities in West Greenland for fossil plants is Atanikerdluk, an uninhabited part of the south coast of the Nugssuaq peninsula. The main ravine is not only of special interest geologically; it also affords a most remarkable display of dykes, and illustrates on a grand scale the relation between scenery and rock structure. A stream flows among jumbled heaps of boulders at the bottom of a steeply inclined valley; the valley slopes consist of natural embankments of loose light-yellow sand mixed with milk-white rounded pebbles of quartz detritus formed by the erosion of the sandstones, which are here the dominant rocks. In places the talus slopes are replaced by exposures of the rocks themselves, thick beds of sandstone with no division into layers, thinner well-stratified beds, bands of shale, and an occasional seam of coal. These sedimentary strata, having a total thickness of many hundred feet, exhibit here and there on an exposed plane of bedding a series of ripple-marks and afford other evidence of their origin as sheets of sand and mud in shallow water and among drifting currents. Many of the sandstones are made up of thin layers, often rendered more conspicuous by the presence of iron-stained bands, which exhibit the well-known arrangement spoken of as current-

FIG. 3.—THE BEACH, UPERNIVIK ISLAND

On the left an obliquely vertical dyke of basalt (behind the large boulder in the foreground) cuts across the sedimentary rocks; the mountains on the right are composed of older (Archæan) igneous rocks.

[1] I.e. the sloping mass of fragmentary stones often found at the foot of cliffs or rocky declivities.

bedding—a series of layers sloping at a certain angle is cut off by another set sloping in a different direction. This frequent variation in the lie of the thin beds is evidence of the deposition of sandy sediment in water with eddying and shifting currents. Dark-brown dykes cut across the sands, and sometimes intersecting dykes project like pieces of a huge network. An even more impressive example of intrusions of igneous rock is afforded by vertical walls of basalt which stretch across the valley. These magnificent dykes do not form continuous curtain walls from one side of the valley to the other, but the rocks are twice or thrice stepped on each side: the light-brown wall of basalt towers against the sky at least 100 feet above the upper level of the slope of the ravine. Its jagged and weathered ledge projects horizontally for some distance towards the middle of the valley and is then cut vertically down into a deep step, and this is repeated two or three times. At the foot of the valley the dyke crosses the stream as a resistant barrier where the water falls in a cascade. The light-yellow colour of the sandstones and the darker tones of the basalts are relieved by clumps of bright yellow Dandelions and Arnicas, purple Willowherbs, and clusters of the tall russet-brown Oxyria, a plant allied to the common Dock.

A Peasant Poetess of Normandy

By George Frederic Lees

ONE might search for a long time in the annals of literature before finding a parallel to the case of the Normandy poetess, Rose Harel, with whose shade and amidst whose memories, in orchards laden with apple-blossom, I spent a happy vacation some months ago. For this remarkable woman was of peasant origin, at any rate on her mother's side, and yet she showed, in one springing from the soil and without any early education, a delicacy of feeling and faculty of poetic expression which are remarkable.

Who that *père inconnu* inscribed with the entry of her birth (in 1828) in the registers of Bellon, a humble little village in the Department of the Orne, was will never be known, but it is not unreasonable to suppose that he was a man of somewhat higher position and education than her mother. Rose was neglected and uncared-for from the very beginning of her life, but was by no means an unhappy child, since in after-years she always spoke with affection, both in her poems and in private conversations, of the little cottage covered with Bengal roses, around which she spent her days in perfect freedom. Chiefly on account of her mother's indifference to her welfare, but also because of poverty, schooling in France in those days being exceedingly dear, she received not even the rudiments of education.

It was not until she had reached the age of thirteen that she was taught her letters. At that time she was working a hand-loom in a noisome cellar at Vimoutiers, weaving being thought more suited to her delicate constitution than the rough work of the fields, to which children of her class were generally put. Two or three friends in the same humble station of life as herself took pity on her and assisted her to the best of their ability. Another friend a little later gave her lessons in writing and spelling in the evenings, when hand and eye were weary with the day's work. Rose showed invincible courage in learning, and her active brain enabled her quickly to make up for lost time. Once having learnt how to read, she read everything that came within her reach with the utmost avidity. There was one book in particular (almost the first, if not actually the first, notable work which fell into her hands) which had a special charm for her, and exercised a powerful influence on her rapidly growing mind—a much-dilapidated copy of the *Aventures de Télémaque, fils d'Ulysée*, which one day she found in the attic of the house where she was employed. Weary with fatigue, and overcome with sadness at her hard lot, the sensitive girl had fled there from her damp cellar, little expecting to meet with such a friend. This graceful prose poem, produced by Fénélon in 1699, was for quite a century and a half the most read and appreciated book in France. Lamartine, whose melancholy nature had much in common with that of Rose Harel, bears witness in the preface to his *Premières Méditations* (1820) to the benefit received when a child from reading Tasso's *Jerusalem Delivered* and Fénélon's *Télémaque*, which he found on a dusty shelf in the drawing-room of his father's country house. Its gods and goddesses, nymphs and satyrs, shepherds playing on flutes under the shade of young elms or by the side of clear fountains, were people of a new world to Rose Harel—a new and yet, at the same time, an old, familiar world which she often felt she had known since earliest childhood. Passages on nature touched her strangely. There were, indeed, many things described in *Télémaque* which she had seen with her own eyes in her native Normandy: lands covered with a golden harvest of fruit under the heavy weight of which labourers bowed their shoulders, smiling valleys and fields, shady groves gemmed with flowers and ringing with the song of birds, and dark, mysterious forests full of strange sounds and fragrant odours. And it was largely in

making this comparison between Fénélon's somewhat artificial description of the ancient classical world and the very real pictures of nature with which she was surrounded that her mind developed in its particular direction.

Almost simultaneously with the writing of her first poems she determined to give up weaving, owing to the detrimental effect which work under such terrible conditions as those already mentioned was having on her health, and become a general servant. The history of letters contains many pathetic stories, but I think there is hardly one sadder than that which opened at this period of Rose Harel's life. Her entering into service was the signal for a multitude of misfortunes and, worse still, persecutions, which only ended with her death. During more than thirty years she passed from house to house in Vimoutiers, Pont l'Evêque, and Lisieux, hardly ever treated with consideration, and frequently ill-treated and ill-fed. Norman housewives could not understand this woman with high, intellectual forehead and most intelligent eyes, who showed so keen a desire for learning and who wrote poetry in her leisure hours ; they looked upon her as a vain creature, apeing the manners of women of education, and they even declared she was a *folle*. How deeply she felt this attitude may be realised from the poem, written when she was thirty, beginning " J'ai vécu longtemps pauvre, mais sans orgueil " (Long have I lived in poverty, but without pride).

Losing place after place, Rose Harel at last endeavoured, as far as lay in her power, to hide the talent which a number of friends belonging to the more intellectual section of the inhabitants of Pont l'Evêque and Lisieux had helped to foster. But in repressing her instinctive desire to put her impressions on paper she suffered much mentally. Moreover, whilst working in the cellar at Vimoutiers she had contracted tuberculosis, and her bodily health began to show signs of decline. After the appearance of her first volume of poems, which was published in 1864 by private subscription, principally through the efforts of one of her most enthusiastic admirers, M. Adolphe Bordès, she was no longer able to obtain a good position as a servant. She sank lower and lower, until, mentally cast down and undermined by disease, she was driven to accept a situation with a cheese-merchant on the Boulevard de Pont l'Evêque, at Lisieux, who employed her in scraping cheeses and in doing the rough work about the house. It was there—in a cold, pestilential, windowless cellar—that a literary lady of Lisieux, Mme. Marie de Besneray, who had been struck by the beauty of her poems, found her one winter's day, and rescuing her from bondage, provided for all her needs for the few remaining years of her life.

On July 5, 1885, the poetess died in the arms of the excellent woman who had befriended her. Not long before, the curé of the parish of Lisieux had been summoned to administer the last sacraments, but Rose declined to see him. " Ce monsieur le curé-là," she said to Mme. de Besneray, " is too grand a gentleman for me. . . . I do not want this fine cathedral God whom he brings to me. . . . If you wish to bring anyone to see me, find a good, very simple God, a good God of the countryside." A *bon Dieu de campagne* was found in the curé of Beuvillers, who persuaded her to observe the rules of the Church, but " on condition," she said, " that there are plenty of flowers." Her thoughts to the last were centred on the pageantry of nature.

Rose Harel's two volumes—*L'Alouette aux blés*, published in 1864, and *Fleurs d'automne*, published in 1885 under the auspices of Mme. de Besneray—contain abundant evidence that the things of nature moved her deeply. Her poetry, it is true, is unequal, which is not in the least surprising, but it is sweet and musical, and moreover her descriptions of the country are characterised by the strength and simplicity of Nature herself.

L'Alouette aux blés—" this book into which I have put all my soul," as she confesses in an opening poem —and *Fleurs d'automne* are both largely autobiographical. She is constantly telling the reader of her ideals and life as a child, or describing the old cottage at Bellon and its surroundings. Wandering about in the woods and fields she relates how enraptured she used to be—" sans savoir pourquoi ni comment "—by Mother Earth. In these reminiscences—pictures of shady forests, winding footpaths buried in trees, solitary places shaded by oaks and elms, waving cornfields and blossom-laden orchards—she is nearly always light-hearted and cheerful. There are times, however, when her note is entirely melancholy. A single flower is sometimes enough to make her ask herself, in her captivity amongst townspeople, if the country is really still rich with golden corn ; if the redbreast still sings there in the evening ; if chaffinches still make their nests in the moss-grown apple-trees of Normandy orchards.

S'il me plaît d'invoquer pendant mes rêveries
Mes premiers jours passés, mes songes de vingt ans,
Je dis à mon esprit : " Retournez dans les champs,
Dans les grands bois touffus, dans les vertes prairies,
Où, jeune, j'aimais tant à m'égarer le soir
Quand mon cœur débordait et de sève et d'espoir."

Lorsque j'ai ressaisi seulement pour une heure
Ces rêves envolés, ces souvenirs des champs,
De mon cœur réchauffé montent alors des chants,
Chants où l'espoir sourit, chants où le regret pleure . . .
Espoir, bonheur, amour, fantômes du passé,
Comme vous fuyez vite à mon souffle glacé !

[If it pleases me to invoke during my reveries
The days of youth, my dreams when I was twenty,
I say to my spirit: " Return to the fields,
To the big dense woods, to the green prairies,
Where, as a child, I loved so much to lose my way
When my heart was overflowing with joy and hope."

When I have captured again if only for an hour
Those dreams on the wing, those memories of the fields,
There rise then from my comforted heart songs
Full of smiling hope, songs full of sorrowful regret . . .
Hope, happiness, love, phantoms of the past,
How quickly you depart before my icy breath !]

Like Millet, whose rustic scenes, by the by, are sometimes brought to mind by Rose Harel's lines, this poetess was a profound believer in the voices of nature. There are many references in her poems to the mysterious voices which she heard when a child among the trees, and in brooks rippling over pebbles and between mossy banks. That they did not always bring happiness to the hearer she was ready to admit, and in one poem, entitled " Conseil," she cries :

N'écoute pas la voix qui chante,
Enfant, à la rive des bois,
Voix mélancholique et touchante
Qui prend l'être entier à la fois.

[Listen not, Child, to the Voice
Which sings at the edge of the wood,
The melancholy and touching voice
Which at once absorbs one's whole being.]

Not that the voice spoke falsely, but because the contrast between the poet's vision and the world to which she would have to return was so disheartening. In spite, however, of the disillusionment which Rose Harel so often experienced, she would not for the world have relinquished her power ; she had too true a poet's heart to lose faith because of momentary suffering :

Ce que me disent le brin d'herbe
" Que Dieu ne créa point en vain "
Et le chêne à l'aspect superbe
Qui croît sur le bord du ravin,
Nul ne le sait, nul ne s'en doute,
Nul ne comprend ce que j'écoute
De leur idiome divin.

Jeune, j'avais le privilège
De comprendre déjà ces voix ;
Oh ! combien de fois m'attardai-je
A les écouter dans les bois !
Elles me parlaient d'espérances,
Ces menteuses voix du silence ! . . .
Et j'y croyais, comme j'y crois.

Depuis j'ai versé bien des larmes,
J'ai bien souffert, j'ai bien gémi,
Et j'ai toujours senti leurs charmes,
A leur accent, toujours frémi.
Qui dans son âme, un jour blessée,
Voit la poésie effacée,
N'était poëte qu'à demi.

[That which the blade of grass telleth me—
The grass " which God created not in vain "—
And the oak of proud bearing
Which grows on the ravine's edge,
No one knoweth, no one suspecteth,
No one can guess what I understand
Of their divine language.

Even when young, it was my privilege
To understand those voices.
Oh ! how many times I tarried
To listen to them in the woods !
They spoke to me of hope,
Those deceitful voices of silence ! . . .
And I believed in them—as still I do.

Since, many tears have I shed,
Much have I suffered and many my groans ;
But I have ever felt their charm
And at their accent ever trembled.
He who, one day, with wounded soul,
Saw poesy effaced
Was but half a poet.]

Fleurs d'automne, which marked a considerable advance on her preceding volume, contains many poems in praise of country life. Some of these are very popular in certain parts of Normandy, country people and their children in the neighbourhood of Lisieux and Pont l'Evêque, for example, knowing them by heart. They are, indeed, just the kind of poems to appeal to the imagination of peasants: simple, naïve descriptions of their cottage interiors, with the family sitting around the fireside on winter nights, telling stories, and of the manifold joys of their healthy village life.

Wanderers into little-known by-paths of French literature would do well not to overlook the life and work of this Normandy poetess. An uneducated peasant woman who could attain to such wonderful facility in literary expression in the face of so many difficulties, who at the age of thirty studied Greek and Roman history, the literature of her own country, and philosophy, who astonished everybody by the scholarly knowledge with which she could speak on these subjects, and who, at a time when hardly anyone in France spoke of the betterment of woman's position, was a convinced *feministe,* was certainly no ordinary mortal.

BIBLIOGRAPHY

L'Alouette aux blés. (Lisieux, 1864.) Published by private subscription under the auspices of M. Adolphe Bordès.
Fleurs d'automne. (Lisieux, 1885.) Edited by Mme. de Besneray.

NEW air schemes shortly to be operated include a London–Brussels–Cologne service by the Instone Air Line, a London–Amsterdam–Bremen–Berlin service by Daimler Hire, Ltd., and the Southampton–Cherbourg and Channel Islands service mentioned in last month's DISCOVERY.

Reviews of Books

THE DEVELOPMENT AND APPLICATION OF PSYCHO-ANALYSIS

Introductory Lectures on Psycho-analysis. By Prof. SIGMUND FREUD, M.D., LL.D. (George Allen & Unwin, Ltd., 18*s.*)

Fundamental Conceptions of Psycho-analysis. By A. A. BRILL, M.D. (George Allen & Unwin, Ltd., 12*s.* 6*d.*)

The Psycho-Analytic Study of the Family. By J. C. FLUGEL, B.A. (The International Psycho-analytic Press and George Allen & Unwin, Ltd., 10*s.* 6*d.*)

The publication of Professor Freud's recent lectures on Psycho-analysis is an event of considerable importance to those who are interested in modern psychology, for it is now more than twenty years since the theories were first propounded, and during this time, as fresh material was brought under survey, they have undergone almost continuous modification and development, though it is chiefly only in their earlier—and cruder—form that they are known to the general public. The theories were received for the most part with an indignant opposition which was unhesitatingly attributed by those who upheld them to prejudice due to sexual repression or to wounded *amour propre*. This may well have been true, at least in part, but some of the opposition may also be ascribed to the singular infelicity with which the theories were presented, and to the failure of many of those who undertook to expound the theories to understand them or to follow their development.

As a typical modification we may take the change of attitude concerning the effect of shocks, especially of a sexual character, experienced during early childhood. These shocks were at first held to be important factors in causing nervous trouble in later life, though they had often been forgotten, and were only recalled to memory during the analysis of the nervous symptoms. It was found, however, that many of the more lurid experiences of childhood related during psycho-analysis were—as often as not—imaginary, that is phantasies "projected backwards" from a later period of life. A deeper and more continuously operative cause had therefore to be sought as a determining factor of the trouble.

As another example we may take an aphorism, which gained a wide currency, from Freud's *Studies in Hysteria* (1895)—the generalisation that "in a normal sexual life no neurosis is possible." In his recent lectures he says (p. 322): "In a very short time my efforts had brought me to the conclusion that no neurosis—actual neurosis I meant—is present when sexual life is normal." This is a very important modification, for the "actual neuroses" comprise but two types of nervous disorder, and two that are but rarely met with; yet Dr. Brill on p. 29 of his *Fundamental Conceptions of Psycho-analysis* says, "Freud's dictum that no neurosis is possible in a normal sexual life holds true even in the psychics," thus perpetuating and extending an error that has long been recognised as such, and has been corrected by Freud himself.

It is not very surprising that the Freudian school has been described as "deriving everything from sex," but the actual position is given by Professor Freud when he says: "Psycho-analysis has never forgotten that non-sexual instincts also exist; it has been built upon the sharp distinction between sexual instincts and Ego-instincts; and in the face of all opposition it has insisted, *not* that they arise from sexuality, but that the neuroses owe their origin to a *conflict* between Ego and sexuality."

In the later developments of Psycho-analysis, the focus of interest seems to be shifting from the study of the libido ("the instinctive forces of the sexual life") to the study of the "Ego-instincts," that is, to the instincts of self-preservation and those impulses by which the individual endeavours to adapt himself to the demands of reality.

But Professor Freud deals only briefly with these later developments of Psycho-analysis, for their field of investigation lies for the most part in the difficult region of the more severe mental disorders, and the lectures are essentially an introduction. He begins with a series of lectures on the psychopathology of every-day life, and devotes a second course of lectures to the psychology of dreams, leading on to the third and last course, which deals with the general theory of the neuroses.

Professor Freud seems a little angry sometimes with those who have opposed his doctrines, and there is rather more than a hint of irony in his elaboration of the difficulties that his hearers will find in accepting his theories. Early in the book there is an echo of the pessimism, that to some of us seems to be faintly heard in all his writings, when he says of sleep: "Our relationship with the world which we entered so unwillingly seems to be endurable only with intermissions; hence we withdraw again periodically into that condition prior to our entrance into the world; that is to say into intra-uterine existence"—a discouraging view of life that would seem rather to be the expression of the writer's feelings, than a necessary corollary to his theories.

Dr. Brill approaches the subject in a very different spirit. The material of his book was taken from a course of lectures, and must have retained much of the form in which it was delivered, for it is written in a hearty, conversational style that recalls the confident experienced physician addressing an audience of students.

The greater part of the book is taken up by a vivid description of the practical application of psycho-analytical methods with many illuminating examples, and so much the reader will learn in the easiest possible way. But the fundamental conceptions of psycho-analysis are very lightly dealt with, and it is doubtful if the reader will carry away a very clear idea of them.

Dr. Brill is a psychiatrist of long experience, and many of his examples are drawn from cases of insanity, so that, although he touches upon other aspects, it is chiefly in its relationship to morbid conditions that the subject is presented. But, though analytical psychology grew out of the study of nervous disorders, it has far wider applications, as, for example, in the fields of anthropology, education, and sociology, and it may even be found that its greatest

value will lie in these directions, less, that is, in treating the neurotic conditions than in preventing them by giving a deeper understanding of the individual and social difficulties from which they arise.

Mr. Flugel's book is therefore, in its way, no less important than Professor Freud's, for this reason: the problems with which it deals, the reaction of the family relationships upon the character of the individual and his attitude towards society, are as urgently in need of study as they have hitherto proved baffling. The author professes to do little more than to apply the methods of psycho-analysis to these problems and to summarise the work of other investigators; yet he has added, as his own conclusions, some very valuable indications of the lines along which the difficulties arising out of the family relationships may be guarded against and minimised. These conclusions he has modestly relegated to the last chapters in which, observing a distinction only too rarely to be met with among psychological writers, he has confined those theories that are not yet clearly supported by observation and induction. It is possible that many readers may find the views expressed difficult to accept, and on one point, that of the origin of birth-phantasies, the author seems to take up an extreme position; but the whole book is closely reasoned (though sometimes the evidence seems a little frail to support the theories built upon it), and clearly, even brilliantly written. Many subjects come within the scope of the title—folk-lore, history, religion, literature—and a wide circle of readers should find the book valuable and interesting.

F. A. HAMPTON.

RECENT DISCOVERIES IN LATER GREEK LITERATURE

New Chapters in the History of Greek Literature, Recent Discoveries in Greek Poetry and Prose of the Fourth and Following Centuries B.C. Edited by J. U. POWELL and E. A. BARBER. (The Clarendon Press, Oxford, 10*s.* 6*d.*)

In this book, which appears a round thirty years after Professor Percy Gardner's *New Chapters in Greek History*, Oxford pauses to take stock of the results achieved in a branch of research in which she has won high distinction in the interval. With the papyrological discoveries of the past thirty years, the names of Grenfell and Hunt, of Queen's College, will always be prominently associated; we have abundant evidence in the present book that other colleges are well equipped to take their share in one section of the heavy task still awaiting completion, the interpretation and criticisms of the new "literary documents." The book naturally confines itself to the "literary" papyri and inscriptions; we must not forget that these represent, in bulk, but a small part of the new evidence which the papyri alone have placed in the hands of the student of ancient civilisation.

For the classical student Greek Literature used to mean the Literature of Athens, with Homer for preface, and Theocritus for epilogue. He had heard of other Alexandrians, but, unless he was interested in Roman literary origins, he seldom read them. The period between the bloom of Athens and the last century of the Roman Republic, a period of great interest to the historian, was for the student of Literature practically a blank. Menander, Herondas, Ephorus, and others were little more than names. The student could see that Menander had a profound influence on Roman Comedy, but he had not the least idea why.

And lo, these names are names no longer, but living men. Authors in every literary genre, moralists, lyric poets, historians, dramatists, orators, walk on to the stage of Literature and make their bow. The parts they have to declaim are generally brief; but it is something to learn Menander's idea of the construction of a plot, to get a real hold on the shadowy Philodemus, to know at last what was wrong with the music of Timotheus. We are already so familiar with the *Constitution of Athens* and with Herondas that we are apt to forget that both are discoveries of the last thirty years.

A brief review like the present must select, and we make no apology for singling out for special notice—as the editors require no apology for including—a document which falls outside the limit of period fixed in the subtitle of the book. The Epicurean philosophers, as the new Philodemus comes to remind us, forestalled the Christian doctrine of verbal inspiration with all its implications, and condemned themselves to interminable discussions as to "what Epicurus or Metrodorus, or any of the other masters, really said or meant." It takes our breath away to learn how seriously Philosophy took herself in those days. The Epicurean fraternities in different cities were in continual communication with each other, controversy over the meaning of the *ipse dixit* went merrily forward, and you had a Rhodian and an Athenian interpretation just as in later days you find a Constantinopolitan confronted by an Alexandrian exegesis. We hear complaints that the "disputants do not even take the trouble to check their references. They say, 'Epicurus wrote thus,' but they cannot say where"—reminding us of a delicious remark in a letter of Synesius, the soldier-bishop of Cyrene, that "he couldn't remember the exact words, but could assure his correspondent that this statement is attributed to God in the Bible." Late in the second century of our era an Epicurean of Oenoanda in Lycia, called Diogenes, built a *stoa* and engraved on it an inscription on the scale of the *Monumentum Ancyranum*, in which the whole gospel of Epicurus was placed before the eyes of citizens and strangers, that no man might perish for lack of the "medicine of salvation."

This is the true missionary spirit, and the inscription, of which large fragments remain, reveals a most interesting character, who is somewhat shaky in his history of philosophy, but conveys his earnest message in excellent Greek. We recall that at this very period the Pauline Churches to the north of Lycia were actively engaged in missionary work, and that a Roman road led from Laodicea to Oenoanda, and we find ourselves wondering whether Diogenes and his fellow Epicureans did more to help or to hinder the efforts of the Christian missionaries. In Lycia the history of Christianity in the first three centuries is a total blank; at the end of the third century

the province emerges, strongly Christianised, into the history of the Church. The inscription of Diogenes gives us an interesting glimpse of the ethical ideals of a section of Lycian society a century earlier. If its contribution to our knowledge of Epicurean theory is slight, it forms a notable landmark in the religious struggle which went on in the eastern provinces during the first three centuries, and has left many traces on the inscriptions of Asia Minor.

The book is the work of eleven writers. The manner in which they have executed their task under somewhat cramping conditions of space compels admiration. We have only two complaints to make. We should have liked a section on Bacchylides; and we feel aggrieved not to be told the name of the writer of the discerning essay on Callimachus.

W. M. CALDER.

The New Decameron. The Third Volume. (Oxford, Basil Blackwell, 7*s.* 6*d.*)

Is the short story coming into its own? There are evident signs, from the number of books of short stories now being published, that it is. One of the most interesting phenomena in this connection is the anthology of short stories by various writers. Several of them have already taken the field, but *The New Decameron*, now in its third volume, may be considered one of the pioneers, and it has certain definite characteristics of its own.

The title is not altogether fortunate, for the volume, being the work of several hands, does not compare happily with the easy, un-self-conscious tale-telling of Boccaccio. The reader cannot rid himself of the feeling that the book is machine-made, and the picture of the frantic though clever editor, attempting to graft the very diverse subjects and styles of his authors onto the main theme of the experiences of Mr. Turpin's personally-conducted touring party in France, persists in coming before his eyes.

Many well-known authors have contributed to the volume—amongst them Compton Mackenzie, D. H. Lawrence, Michael Sadleir. To our mind the two most striking stories are "Chelsea Justice" by V. Sackville West and "The Sceptical Poltergeist" by J. D. Beresford, which come at the end of the book. The first narrates the revenge which a man took on a great friend, who, he believed, had seduced his wife, by shutting him up in a buoy far out to sea off the Cornwall coast, and the second the conversation of a psychical researcher with "what the Spiritualists and Theosophists, and so on, call an 'Elemental.'" For irony and humour backed by a suggestive thoughtfulness, this last tale would be hard to beat amongst those recently devoted to the subject.

E. L.

PROBABILITY

A Treatise on Probability. By JOHN MAYNARD KEYNES. (Macmillan & Co., Ltd., 18*s.*)

The subject of Probability has a much greater importance than it once had, and the appearance of a really comprehensive treatise on the subject is to be welcomed, especially when it bears the marks of careful and impartial, yet original, treatment shown by this volume. The day when probability was regarded as a subject only for theorists and philosophers has gone, and now, whether we are aware of it or not, a great deal of scientific work is implicitly based upon the subject. Thus, when an experiment is repeated and the arithmetic mean of the result is taken, it is implicitly assumed that such an average is the "probable" or "best" value. More often than not such a procedure is justified, but one of the functions of the theory of probability is to examine the logical basis of such methods. Given a certain set of postulates, it is possible to construct a number of theorems in probability, and it is necessary that the fundamental ideas and theorems of the subject should be carefully scrutinised on the grounds respectively of reasonableness and logical consistency. This the author has done, and his exposition of the subject is clear and convincing; he illustrates his argument in a very interesting way, not the least interesting illustrations being taken from arguments in legal proceedings, where a judge and jury often have to determine rough measures of probability. The author gives a human touch to the subject which is very refreshing.

While most people have a fairly clear notion as to what is probable, the translation of a qualitative notion into a quantitative one is not at all simple. Indeed, the author denies that a numerical estimate of probability is always possible, and therefore he avoids an explicit definition of probability, though he has also other grounds for avoiding such a definition. Herein he differs from the procedure of previous writers who early introduced numerical methods. On the philosophical side he may be correct, but there is a need felt for some well-attested method whereby quantitative results can be given and approximate measures of probability be obtained. One of the most common methods used is based upon the frequency theory of probability, which, indeed, is the foundation of most statistical work. Mr. Keynes' discussion of this theory and of the foundations of statistical inference is a valuable portion of the book, even though one's bliss may be shown to be too highly correlated with ignorance. One function of the theory of statistics is to provide methods by which the chief characteristics of phenomena can be described, while a second is to enunciate laws or generalisations. Thus we may say that the arithmetic mean of a set of observed values of x is X, and that the standard deviation is s; these are precisely defined and simply summarise the chief characteristics of the data. But when we infer that X is the "probable" value of x, and that s is a measure of probability of deviation from X, we imply a set of postulates and theorems concerning probability. As the main difficulties of the subject arise in the interpretation of statistical results, it is vital that there should be a thorough understanding of the conditions under which inductions can be made; otherwise "statistics can prove anything." The author is careful to enforce the contrast between statistical description and statistical induction, and he deals almost entirely with the latter, whereas nearly all statistical treatises are mainly concerned with the former. For this reason the book is a valuable supplement to those treatises, especially as the author warns us

that the application of common sense is not a universal safeguard. The student of statistics will be well advised to read what the author has to say about the subject of statistical inference, and the book can be recommended to all students of science.

The author gives a copious bibliography, and he also includes a short account of European developments which may be new to many. A. T. DOODSON.

Books Received

(Mention in this column does not preclude a review.)

MISCELLANEOUS

The Phylogeny of Man from a New Angle. By CHARLES HILL-TOUT, F.R.S.C., F.R.A.I., etc. (Ottawa: Printed for the Royal Society of Canada.)

Tendencies in Renaissance Literary Theory. By BASIL WILLEY, B.A. (Cambridge: Bowes & Bowes, 2*s.* 6*d.*)

The Czechoslovak Republic. By JAROSLAV CÍSAŘ and F. POKORNÝ. (T. Fisher-Unwin, 9*s.*)

SCIENCE

Das feinbauliche Wesen der Materia nach dem Vorbilde der Kristalle. 3rd Edition. By Prof. Dr. FRIEDRICH RINNE. (Berlin: Gebrüder Borntraeger, 10*s.* 6*d.*)

An admirable account in German of recent work on crystal structure for specialists.

Recent Progress in Rubber Chemistry and Technology. By PHILIP SCHIDROWITZ, Ph.D., F.C.S. (Benn Brothers, Ltd., 3*s.* 6*d.*)

A résumé of recent work for specialists on the chemistry of rubber, the processes of vulcanising, etc.

Early Science in Oxford. Part II—Mathematics. By R. T. GUNTHER, Magdalen College, Oxford. (Humphrey Milford, 10*s.* 6*d.*)

The first volume of this series has been noticed in an earlier issue, and this volume will appeal to those who were then interested. It gives an account of the mathematicians, instrument-makers and their mathematical instruments, connected with the University of Oxford from early times to the beginning of the nineteenth century. It is a book of great importance to those who care for these things. The compiler is qualified both on the historical and the scientific side, and is, in addition, an enthusiast.

Evolution of the Essex Rivers and of the Lower Thames. By Prof. J. W. GREGORY, D.Sc., F.R.S. (Colchester: Benham & Co., Ltd., 2*s.* 6*d.*)

A monograph, written by one of the clearest exponents of geological subjects in our country, that should be specially interesting to East Anglians.

Radio Receiving for Beginners. By RHEY T. SNODGRASS and VICTOR F. CAMP, A.I.R.E. (Macmillan & Co., Ltd., 3*s.* 6*d.*)

An American book for wireless enthusiasts, clearly written, with good diagrams and containing much needful information.

Correspondence

THE PROBLEM OF PERSONALITY

To the Editor of DISCOVERY

SIR,

There is no doubt that the problem of personality is of great importance; in fact, it may be said that it is *the* problem from which all others derive their importance. I believe a great deal of light could be thrown on the subject if trained scientists in all branches were to devote to it even a fraction of the energy which they expend on their special pursuits. Most scientific specialists, unless I am greatly mistaken, either ignore the subject (except in their personal lives, where it is inevitable) or regard it as an abstract inquiry which is the business of specialists in philosophy and psychology.

Before any advance can be made in this direction, some provisional *meaning* should be given to the word "personality." We cannot expect to define it precisely, for that would amount to directly solving the problem.

The first point to be settled is whether the person is to be identified with the conscious Self, the centre of values from which all "things" derive their values, including the bodily organism. If this be so, we cannot possibly agree with Mr. J. S. Huxley's theory that personality is merely one of the various properties of the organism as a whole. This would be a return to the old fiction that the brain secretes feelings and thoughts just in the same sense as the kidneys secrete urine. I feel sure that Mr. Huxley did not mean this, but the ambiguity of the term "personality" leaves it open to question.

In the history of philosophy a kind of compromise has been attempted for several thousands of years. The "person," or its equivalent in other languages, has been identified with the union of the Self and a physical organism.

If this view of personality be accepted, it might form a good groundwork for scientific inquiry. But no good can come of it unless it is recognised all through that the Self is essentially distinct from the physical body The body is the *instrument* of the Self, even if it be a bad instrument. The relation is absolutely irreversible. It is meaningless to speak of the Self being the instrument of the body, since the body of itself has no values and seeks no instruments. Heredity and environment and sex are alike instruments of the Self.

Yours, etc.,
R. A. P. ROGERS.

TRINITY COLLEGE, DUBLIN.
June 28, 1922.

[The above letter is printed in accordance with our policy of allowing expression to all points of view on a question. But we doubt if any successful scientific inquiry into the problem could be carried through on the basic argument that "the Self is essentially distinct from the physical body," as it would start from an assumption of which there is, so far as strictly scientific method can guide us, no proof forthcoming.—ED.]

THE PREVENTION OF WAR: A SUGGESTION

To the Editor of DISCOVERY

SIR,

I quite expected some correspondence in the August issue regarding the question of "War" raised in your "Notes" for July. As this does not appear to have materialised, I venture the following remarks. Let us assume that war is not a biological necessity, that is, not necessary for the good of the race; that the future of the race is unaffected one way or the other by war. War, however, does harm the majority of its contemporaries and their immediate descendants, and is, therefore, a crime. Let us, therefore, perhaps through the League of Nations, declare boldly that war is a crime, and that those who declare war are criminals; let us enact in every country an unbreakable law that on the declaration of war all the members of the Cabinet (or its equivalent) be shot within twenty-four hours as criminals. Of course, some wars may be righteous wars, and in such cases, without a doubt, the statesmen concerned would patriotically give up their lives for their country by declaring war, as the soldier is expected to give up his by fighting a war for he knows not what.

The sudden dislocation of government in the two countries party to the dispute, which had occasioned the declaration of war, would, of course, give an opportunity for a further examination of the grievance by a fresh set of men, with the certain result of a peaceful settlement, the only deaths from the war being a few fiery old politicians who must have been tired of life anyway.

Yours, etc.,
PERCY J. STIRRUP.

LANGDALE
CHURCH LANE, OXHEY,
NR. WOLVERHAMPTON.
July 28, 1922.

[The freshness of this letter would be quite spoilt by any editorial comment. . . .—ED.]

THE INVENTION OF THE PILOT CABLE

In DISCOVERY for June we printed a letter from Dr. Cargill Knott, the secretary of the Royal Society of Edinburgh, pointing out that M. William Loth's discovery of the method of guiding a ship into port by detecting electrically a cable laid in the bed of the channel, of which a description appeared in the April issue, had been anticipated by the experiments of Mr. C. A. Stevenson thirty years ago. M. Loth has now written in reply to Dr. Knott, but his letter is too long and his diagrams too technical to warrant their publication in full; the gist of his case, however, is given below.

The point at issue is: was it possible with the apparatus described by Mr. Stevenson in 1892 to guide a ship safely along a channel into port? M. Loth has examined the problem in detail and has concluded that it was not. He agrees that Mr. Stevenson's detecting apparatus will detect a cable's presence, but he declares the method as described will not allow a ship to be steered safely into port. There is, of course, a large difference between merely detecting the presence of a cable and accurately steering a ship by knowing where the cable is. Mr. Stevenson's description is too vague; he talks about his detector being on the ship, or *let down by rope or cable*, or *coiled round the hull of the vessel*. But this describes the detector too loosely, and a ship could not in fact be steered safely in this way. The problem is really complex and difficult, and several problems had to be studied and several difficulties to be removed, all subsequent to Mr. Stevenson's work, before the problem of guidance might be described as solved.

M. Loth declares that Dr. Knott, in putting forward Mr. Stevenson's claim to recognition, has mistaken the detection of a submarine cable for the solution of guidance. But really, unless the method leads to safe guidance, it cannot be said to anticipate his own work. And also, unless it does, it can hardly be said to have been novel in principle, even in 1892. For the detection of a submarine cable by electromagnetic means was first accomplished by Sir William Preece eight years before.

M. Loth declares that his own system of detecting a submarine cable is essentially different from Mr. Stevenson's and that his system allows ships to be safely guided into port, whereas Mr. Stevenson's does not and never has done. During the war the Admiralty did not use Mr. Stevenson's system because they did not think it safe enough for their ships; they adopted a very different system. M. Loth's system was, however, adopted by the French Admiralty.

BANANA SEEDS

To the Editor of DISCOVERY

SIR,

In the article *Sex and its Determination* in your August number, the following sentence occurs: "The banana, for instance, never sets seed." I used to think so too till 1881, when my teeth jarred on a banana seed and warned me ever since not to assume that your teeth will go safely through a banana. It is, I know, popularly assumed that the plant does not seed, and I have read eloquent accounts of it as one that has forgot to seed; but it is well known to botanists that the plant *does* seed, as will be seen from the following extracts from Alphonse de Candolle's *Origin of Cultivated Plants*:

Page 305: "No one pretends to have found in America, in a wild state, varieties with fertile fruit, as has happened in Asia."

Page 307: "The cultivated varieties seldom produce seed."

The first extract probably gives the cue to the myth of the banana not seeding, as those sold in this country all come from the West Indies. I myself lived many years in India before coming across the seed, and then not till I was sent to Bengal. Here I came across it three or four times altogether in eating the fruit, but I frequently used to see fine large bunches on plants growing on the embankments I had to look after, and used to wonder why the thrifty native of India did not gather them, till a rather comical incident revealed the cause.

I was travelling down a canal with my superior, and as we came to a lock he said: "I must get that bunch of bananas that I have noticed for some time"; and, calling out to the lockmen, he ordered them to bring him the bunch. Instead of a bunch with fine large fruits they brought him a miserable bunch of half-grown fruit. He got angry, refused it, and ordered a better one to be brought and, as there was some delay, he jumped out of the boat and, walking towards the plant he had seen, pointed in its direction while some distance away. The lockmen replied in a contemptuous tone, "Oh! that's a 'seeded' banana," and promptly ran off for the bunch, while my superior, seeing his ridiculous position, walked back to the boat, as he said, with his tail between his legs, while one of the men ran up to him with two or three bananas broken open to show that they were full of seeds.

The plant has been grown from seed, as will be seen from the following extract from Roxburgh's *Flora Indica*:

"In the course of two years from the seed received from Chittagong these attained to the usual height of the cultivated sorts, which is about 10 or 12 feet . . . and ripen their seed in five or six months afterwards," i.e. after flowering.

I kept a seed by me for a long time. It was somewhat smaller than the size of a broad bean, but more rounded with a projection at one side, black in colour, and about a twelfth of an inch thick.

Yours, etc.,
C. H. De Mello.

Riverside,
Castle Street, Salisbury.
August 1, 1922.

SECONDARY SEXUAL COLOURS AND STRUCTURES

To the Editor of Discovery

Sir,

Mr. Huxley, in his article on "Sex Determination" in the August number of Discovery, states that the female requires to be courted by the male in order that the sexual instincts may be stimulated, and definitely states that this requirement is the cause of the brilliant colours and conspicuous structures of many male animals.

As Discovery is largely read by the general public, it seems particularly undesirable that this very controversial consideration should be stated as if it were an established scientific fact.

A slight survey of the distribution of these sexual differences at once shows that female courtship is not the determining factor. Since in nature brilliant coloration is admittedly a danger to the wearer, it might be anticipated, according to Mr. Huxley's views, that the males of powerful or unpalatable animals would especially be free to exhibit this requirement for the courtship of females, because of their relative freedom from the attacks of enemies. Actually, the reverse is the general rule; it is among palatable and defenceless animals that the most brilliant males are to be found, whereas in unpalatable and powerful animals the sexes are usually alike. Compare, for instance, Crows, Kingfishers, Shrikes, Vultures, Geese, and Swans with Pheasants, Ducks, and Finches.

It is clear that some factor other than the requirement of courtship by females determines the occurrence and magnitude of secondary sexual differences.

Yours, etc.,
J. C. Mottram,
Director of the Research Department.

The Radium Institute,
Portland Place, London, W.
August 23, 1922.

SHELLEY'S BOAT, THE *ARIEL*

To the Editor of Discovery

Sir,

In the interesting article on "The Fate of a Great Lyric Poet," the boat built for Shelley is described (p. 185) as an open boat twenty-eight feet long, ketch-rigged. Later on, the *Ariel* is said to have been schooner-rigged (p. 216).

The illustration on p. 217 shows a yawl, and if the crew are drawn in anything like proportion, the length is more like forty-eight feet than twenty-eight feet. The tall mast, large sail area, and low freeboard suggest a decked yacht rather than a small open boat. Perhaps the vessel shown in the illustration is Byron's *Bolivar*, or it may be only a conventional representation of a British yawl yacht of the period.

Soundings on the chart may show if a boat could have been recovered from the bottom of the sea fifteen miles off Viareggio.

Yours, etc.,
John A. Stewart.

6 Clifton Place,
Glasgow.
August, 2, 1922.

[I am not prepared to lay down the law on what type of vessel the *Ariel* really was. Contemporary descriptions of the boat vary too much to allow anyone to make a final statement. In describing the boat as "ketch-rigged" I followed the writer of the biography of *Shelley* (in the People's Library), who appears to me to have considerable first-hand knowledge of sea-craft. The later reference to the boat mentioned by Mr. Stewart is contained in an extract from the Royal State Archives of Lucca, which certainly describes it as "schooner-rigged." As to its length, contemporary descriptions agree that it was twenty-eight to thirty feet.

The illustration on p. 217 was taken from Trelawny's *Recollections of the Last Days of Shelley and Byron* (Moxon, 1858), published during the author's life, and was accompanied by the following legend: "Captain D. Roberts, R.N., *del.* Villa Magni, Shelley's residence on the Gulf of Spezzia, A.D. 1822, with the boat (the *Don Juan*) in which he was wrecked." The *Don Juan* was the original name of the *Ariel*.—Ed.]